APPENDIX A

EPA/ROD/R05-00/088
2000

EPA Superfund Record of Decision:

MIG/DEWANE LANDFILL
EPA ID: ILD980497788
OU 01
BELVIDERE, IL
03/31/2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590
MAR 31, 2000

REPLY TO THE ATTENTION OF

SR-6J

Thomas V. Skinner, Director
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: MIG/DeWane Landfill Superfund Site -- Belvidere, Illinois
Region V Concurrence on Record of Decision

Dear Mr. Skinner:

The U. S. Environmental Protection Agency (U. S. EPA) has reviewed the Record of Decision (ROD) prepared by the Illinois Environmental Protection Agency (IEPA) for the subject site. Region V hereby concurs with the IEPA that the selection of Alternative 4A, a multi-layer cap, with active and passive management of landfill gas, the installation of a localized leachate collection system, the removal of leachate and sediments from the leachate surface impoundment, institutional controls, and the monitored natural attenuation of groundwater, is the most appropriate remedy for the MIG/DeWane Landfill Superfund Site in Belvidere, Illinois.

U S. EPA appreciates the efforts of Rick Lanham of your staff in preparing this ROD. Please feel free to contact me if you have any questions.

Sincerely,

W. E. Muno

William E. Muno, Director
Superfund Division

bcc: Richard Clarizio, ORC

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

MIG/DeWane Landfill
Belvidere, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the MIG/DeWane Landfill ("the Site") in Boone County, Illinois. This remedial action was chosen in accordance with the Illinois Environmental Protection Act, 415 ILCS 5/1 et seq.; the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. 9601 et seq. by the Superfund Amendments and Reauthorization Act of 1986 ("SARA"); and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the final remedy for this Site. The decisions contained herein are based on information contained in the Administrative Record for this Site. The United States Environmental Protection Agency ("U.S. EPA") has expressed a willingness to concur with the selected remedy. The letter of concurrence will be added to the Administrative Record.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision ("ROD"), may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The remedial action contained in the ROD will be a final Site-wide remedy. The selected remedial action addresses the major threats posed by the Site. The remedial actions include the containment of the landfill wastes by the installation of a multi-layer cap, the active and passive management of landfill gas, the installation of a localized leachate collection system, the removal of leachate and sediments from the leachate surface impoundment, and the monitored natural attenuation of groundwater. The final remedy builds on previously implemented interim response

actions, and emergency response and removal actions. These actions include: an interim cap, pumping down of the leachate surface impoundment liquids, and the recent installation of a landfill gas interceptor trench and gas extraction system in the area adjacent to the west side of the landfill. The final remedy selected for the Site incorporates both the long-term monitoring and operation and maintenance of these components, as well as other response actions. The function of these actions is to properly close the landfill and surface impoundment, to control the migration of landfill contaminants to the groundwater and other media (especially landfill gas emissions), and to reduce the risks associated with any possible exposure to contaminated materials. This remedy is intended to be the final action for the site, and addresses all contaminated media: contaminated soil, sediment, groundwater, landfill wastes, leachate generation, and the emission of landfill gases.

Specifically the Illinois Environmental Protection Agency ("Illinois EPA") has determined that the following measures should be implemented as the long-term remedy in order to fully address all threats to human health and the environment posed by contamination at the Site:

- Institutional controls in the form of future land-use and groundwater use restrictions for the landfill Site and areas west and north of the Site;
- Closure of the surface impoundment through the removal of all leachate liquids for off-site treatment and disposal;
- Excavation and consolidation of leachate surface impoundment sediments under a new multi-layer landfill cap;
- Construction of a new multi-layer landfill cap to cover and contain landfill wastes, minimizing the infiltration of precipitation to reduce leachate generation;
- Monitored natural attenuation of groundwater to attain groundwater chemical-specific ARARs (i.e., Illinois Class I groundwater quality criteria) and long-term groundwater monitoring;
- Leachate monitoring of hydrostatic conditions within the landfill interior and off-site landfill gas monitoring to the west of the Site;
- The continued operation, maintenance, monitoring and evaluation of the gas collection system. This system is comprised of extraction wells and a gas interceptor trench (installed and operating since May 1999), located west of the landfill and designed to meet the ARAR standards and be protective of the residential homes located west of the soil borrow pit area. This portion of the remedy will be operated in the active mode until such time as it can be demonstrated by offsite monitoring and data evaluation efforts that landfill gas migration no longer poses a concern to potential residential exposure points

or an exceedence of ARAR standards;

- Enhancement of the present gas collection system with passive gas extraction wells to be located within the interior of the landfill;

- Active leachate removal using the existing leachate removal system that underlies the eastern portion of the landfill Site and a system of either permeable bed layers or side slope drainage trenches, with the potential for contingent leachate removal upgrade options, constructed in major seep areas along the northern and western portions of the landfill, will occur and be subject to further study, and evaluation of hydrostatic conditions during the Pre-Design phase;

- Off-site treatment of collected leachate by direct discharge to POTW or alternative commercial disposal facility (on-site pretreatment may be required to meet applicable POTW effluent criteria);

- Construction of a surface water diversion system along the landfill side slopes, which may include drainage ditches around portions of the toe of the landfill, where feasible, and corresponding discharge routes (including necessary erosion control measures, structures, etc.).

DECLARATION of STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The remedy partially satisfies the statutory preference for treatment as a principal element of the remedy. Treatment is not considered to be practicable for all the landfill waste due to the large volume and heterogeneous distribution of waste at the Site. Leachate, however, will be treated.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

It is the considered opinion of the Illinois Environmental Protection Agency (Illinois EPA), in consultation with USEPA Region V, that the selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action (or invokes an appropriate waiver), is cost-effective, and utilizes permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable and satisfies the statutory preference for remedies that employ

treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on-site above levels that will allow for unlimited use and unrestricted-exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be protective of human health and the environment.

ROD DATA CERTIFICATION CHECK LIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record for this site.

- Chemicals of concern and their respective concentrations.
- Baseline risk represented by the chemicals of concern.
- Cleanup levels established for chemicals of concern and the basis for these levels.
- How sources materials constituting principal threats are addressed.
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD.
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision.)

Thomas V. Skinner — 3/30/00

Thomas V. Skinner, Director
Illinois Environmental Protection Agency

Date

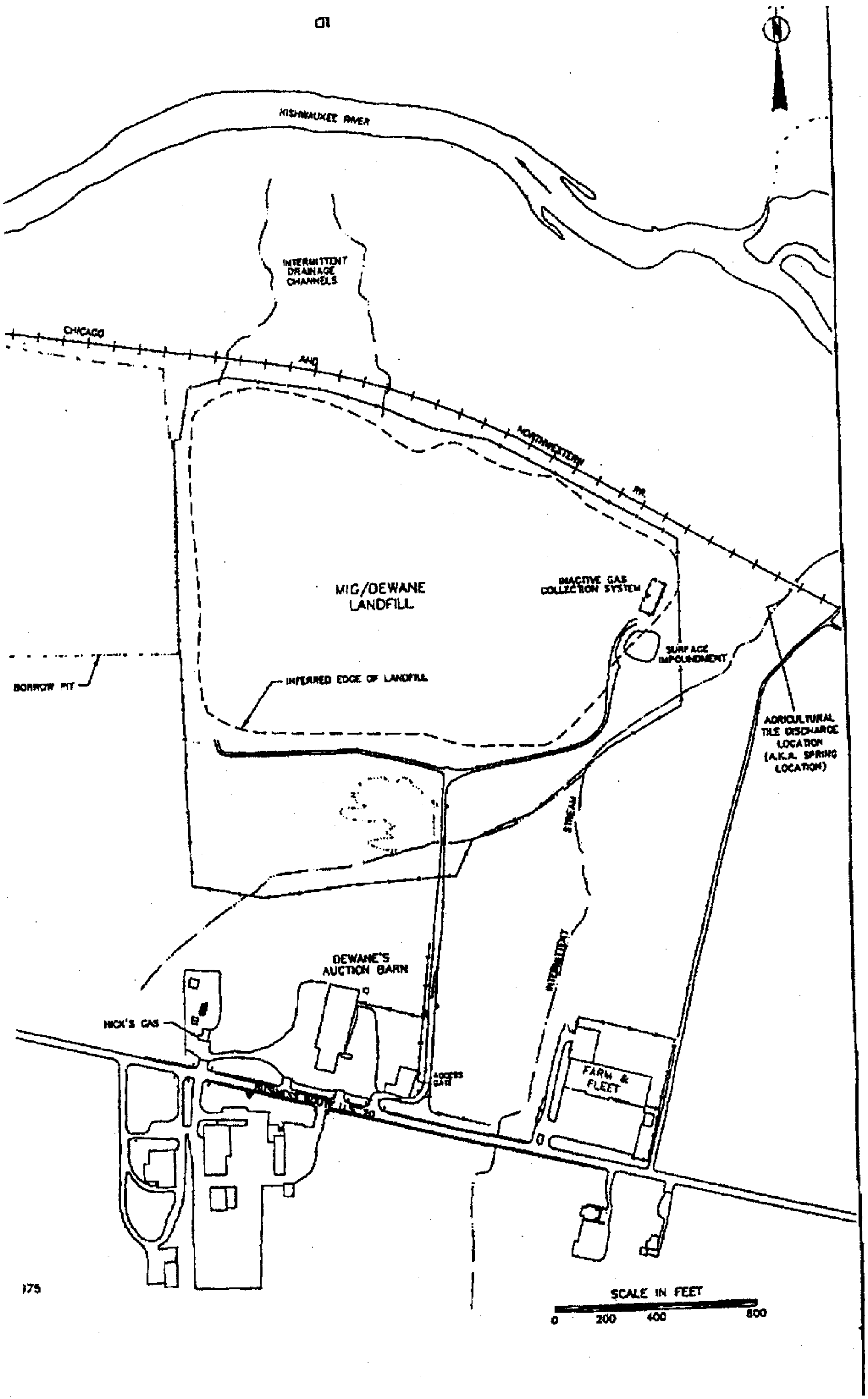
RECORD OF DECISION

for

MIG/DeWane Landfill

I. Site Name, Location and Description

The MIG/DeWane Landfill, also known as Boone Landfill, Bonus Landfill, or Rermedy Landfill is located in Boone County, Illinois approximately 0.25 miles east of the City of Belvidere and 0.5 miles north of Business United States (U.S.) Route 20. The landfill is located primarily in the south half of the southeastern quarter of Section 30, Township 44 North, Range 4 East. A map is provided below for reference.


KISHWAUKEE RIVER
INTERMITTENT
DRAINAGE
CHANNELS
CHICAGO
AND
NORTHWESTERN
RR.
MIG/DEWANE
LANDFILL
INACTIVE GAS
COLLECTION SYSTEM
SURFACE
IMPOUNDMENT
BORROW PIT
INFERRED EDGE OF LANDFILL
AGRICULTURAL
TILE DISCHARGE
LOCATION
(A.K.A. SPRING
LOCATION)
STREAM
INTERMITTENT
DEWANE'S
AUCTION BARN
HICK'S GAS
ACCESS
GATE
FARM &
FLEET
175
SCALE IN FEET
0
200
400
800

The MIG/DeWane Landfill Site occupies an area of approximately 47 acres and rises to a height of approximately 50 to 55 feet above the surrounding terrain. The Site consists of a landfill and a leachate surface impoundment. The surface impoundment was constructed to receive leachate from the landfill's gravity flow, leachate collection system. The Site is bounded on the north by the Chicago and Northwestern railroad tracks and the Commonwealth Edison right-of-way. Agricultural and commercial properties are located to the east and south of the landfill. A soil borrow pit, used to provide soil for the landfill's interim cap, is immediately adjacent to the west of the landfill. Further west of the landfill is a housing development. North of the railroad tracks is an agricultural field that extends to the Kishwaukee River.

The Site contains a municipal landfill that received residential, municipal, commercial, and industrial wastes for disposal. The MIG/DeWane landfill is classified as a Type I landfill. A Type I landfill is a co-disposal facility where hazardous wastes were disposed of with municipal solid wastes. At these types of landfills, discrete "hot spots" are neither known nor suspected to be present. Hot spots consist of highly toxic and/or highly mobile material, and present a potential principal threat to human health and the environment. There are no known or suspected hot spots at the MIG/Wane landfill. A type I landfill also has the presence of hazardous constituents in the groundwater.

A Remedial Investigation and Feasibility Study ("RI/FS") was conducted at the MIG/DeWane Landfill site ("Site") under an Administrative Order by Consent ("AOC" or Consent Order") which was signed on May 29, 1991. This Consent Order was signed by the United States Environmental Protection Agency ("U.S. EPA"), the Illinois Environmental Protection Agency ("Illinois EPA"), and numerous Potentially Responsible Parties ("PRPs"). The RI/FS was conducted by the PRPs, with oversight by the Illinois EPA and U.S. EPA, and was completed in February 1999. During the RI/FS, the U.S. EPA was the lead agency for the enforcement related activities associated with the Site and the Illinois EPA was lead agency for overseeing the technical activities.

It is anticipated that the PRPs will be conducting and funding the remedial actions. They have already undertaken interim remedial actions prior to the RI. Also, after the completion of the RI/FS, due to emergency situation resulting from off-site landfill gas migration, they installed an active landfill gas interceptor trench and gas extraction system. The Illinois EPA provided oversight of all previous remedial action activities, and will continue to do so for the future Final remediation activities.

The objectives of the RI and FS were to determine what contamination may be occurring due to the landfill wastes, to evaluate alternatives for addressing the threats or potential threats posed by the Site's contamination, and to identify, develop, and evaluate cleanup alternatives appropriate for the Site. The preferred remedial alternative for this Site is alternative 4A, which in general is a compromise between alternative 4 and 5. The 4A alternative was chosen because it is the best alternative that meets the CERCLA requirements. It is protective of human health and the environment, complies with the applicable requirements as well as the relevant and appropriate

requirements (ARARs), and is considered to be the best balance of the 9 evaluation criteria for the remedial alternatives.

II. Site History and Enforcement Activities

Site History

The MIG/DeWane (MIG) Landfill operated from 1969 until 1988. The landfill was permitted to receive residential, municipal, commercial and industrial wastes. With the enactment of the Resource Conservation and Recovery Act (RCRA) regulations in 1980/82, however, the wastes received by the landfill were later restricted to nonhazardous. The landfill activities (or lack thereof) that lead to the current problems at the landfill include the disposal of various types of wastes as well as the improper covering of the landfill wastes.

From at least 1968 to 1983, the landfill property was owned by Mr. Raymond DeWane and Ms. Jean Farina (and, until his death, Mr. John L. DeWane). In 1983, the property ownership was transferred to a Trust. In 1991, ownership of the property was transferred to L.A.E., directly. Raymond E. DeWane and Jean A. Farina are the sole L.A.E. shareholders.

Prior to 1969 and until the early 1970's, a gravel pit operated out of the northeastern part of the landfill site, in an area of from 5 to 10 acres. A 1966 aerial photograph documents that the northwest and southern portions of the landfill site consisted of agricultural fields, while the northeast quarter of the landfill contained generally disturbed soil with pockets of excavated soil due to a gravel pit operation. The USGS 7.5 minute series 1970 topographical map of Belvidere North Quadrangle (USGS, 1970) indicates that the northwest and southern portions of the landfill consisted of agricultural fields, while the northeast quarter of the landfill consisted of a gravel pit. The topographical contours suggest that the gravel pit covered approximately 5 to 10 acres with a minimum basal elevation of somewhere between 770 to 780 feet mean sea level (msl).

From 1969 to 1988, the landfill site property was leased by various individuals and companies, including: Mr. Jerome Kennedy, Mr. J.D. Mollendorf; Boone Landfill, Inc.; Boone Disposal Co.; Bonus Landfill Co.; Rockford Disposal Service, Inc.; National Disposal Service; Browning-Ferris Industries of Rockford, Inc.; Browning-Ferris Industries of Illinois; and M.I.G. Investments. In that time the property was operated as a landfill by these entities.

In February 1969, the landfill was registered with the State of Illinois and disposal operations began in the gravel pit. The State of Illinois landfill permits required the placement of a five-foot compacted clay liner across the bottom of the pit, and vertically along the sidewalls. Wastes received were to be disposed of into the clay lined area, compacted, and covered with soil to form a cell. Each daily cell was to be covered by six inches of soil. These and other permit

requirements were required in an effort to protect the underlying groundwater from contamination by the waste disposal. Groundwater monitoring wells were installed at various times and locations.

In 1975, a gravitational flow leachate collection system was completed in the area that now comprises the eastern 1/3 of the landfill. The system allowed landfill leachate to be collected and drained through gravitational flow into a clay lined leachate collection lagoon or impoundment which measured approximately 130 ft, by 130 ft, by 10 ft deep.

In 1984, an U.S. EPA contractor conducted a sampling inspection of the landfill. The sampling inspection was conducted to provide information for evaluating the site for Superfund consideration.

In 1985, the State of Illinois filed a complaint against the landfill operating company, M.I.G. Investments, for violating their landfill-operating permit. The complaint alleged that the landfill operators had violated their permit by allowing the top of the landfill to exceed, by more than 20 feet, the maximum elevation allowed in the operating permit.

The results of the 1984 sampling were used in the U.S. EPA's November 20, 1986 final report evaluation and Hazardous Ranking Scoring (HRS) of the landfill. The evaluation, based on the sampling inspection results and Site history, determined that the landfill leachate was apparently contaminating groundwater, soil, sediments, and noted potential exposure pathways for the contaminants via direct contact, surface water, and groundwater.

In June 1988, a court ordered injunction was issued against M.I.G. Investments for being in violation of the requirements of their landfill operating permit. The injunction required the landfill operators to cease landfill operations. However, the injunction did not affect the need for the owners to meet all the other numerous permit requirements and landfill regulations, such as providing adequate landfill cover material, nor did it affect any necessary landfill closure requirements. The landfill ceased operations in June 1988. However, the landfill operators abandoned it in July 1988 instead of closing the landfill as required by the State of Illinois regulations.

In 1989, based upon the 1984 sampling inspection results, the 1986 evaluation and the HRS, the Site was proposed for inclusion on the National Priorities List (NPL). This is a list identifying sites throughout the U.S. that are eligible for study and cleanup, if necessary, under the Superfund program.

On August 30, 1990 the landfill site was placed on the NPL. Also, on October 29, 1990 the U.S. EPA and a previous operator, Browning-Ferris, Inc. (BFI) entered into a Administrative Order on Consent (Consent Order) for BFI to properly maintain the leachate surface impoundment by repairing and raising the height of the earthen berms, and reducing the level of leachate waters to insure that they do not over flow the impoundment.

In October 1990, the U.S. EPA began sending out Informational Request Letters pursuant to Section 104 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to potentially responsible parties.

On December 19, 1990, the U.S. EPA sent out special notice letters to numerous parties informing them of their potential liability with respect to the MIG/DeWane Site and offering them the opportunity to perform a Remedial Investigation/Feasibility Study (RI/FS). The responding parties formed a potentially responsible party group called "The MIG/DeWane Landfill Task Force" (MLTF). These PRPs are the respondents in the Administrative Order on Consent (Consent Order) dated March 29, 1991. The Consent Order was signed by the various respondents, the Illinois EPA, and the U.S. EPA. These PRPs agreed to conduct a RI/FS. Additional respondents signed onto the Consent Order at later dates. The dates when additional PRPs signed onto the Consent Order include December 18, 1991, April 28, 1993, and August 2, 1995.

During March 1997, the final Baseline Risk Assessment report was completed. The final RI Report was completed in July 1997.

In February 1999, the final FS that discusses and compares the potential clean-up remedial alternatives was completed. Early in 1999 gas probes were installed along the western soil borrow pit area boundary. In late April and early May 1999, extraction wells and an interceptor trench were installed and activated to remove landfill gas migrating offsite. Also, gas and groundwater sampling probes were installed in the Wycliffe subdivision. Gas extraction system and gas probe sampling continued throughout 1999, and continues today.

Sampling for VOCs in groundwater from the soil borrow pit and within the subdivision occurred in February 2000. An addendum to the baseline risk assessment will be based on the sampling results from 1999 and 2000. If the baseline risk assessment addendum determines that an unacceptable risk exists for the residents within the Wycliffe subdivision, then the remediation upgrade contingencies will be re-evaluated to insure that human health and the environment will be adequately protected.

III. Community Participation

The Illinois EPA has taken the lead role in conducting a community relations program for the site. At times the U.S. EPA had provided assistance. Concern about the site has remained somewhat high, with public concern directed mainly to the presence of landfill gas in the proximity of their homes on site rather than the presence of on-site chemical contaminants. A Community Relations Plan (CRP) was developed and issued in March 1993, and a public information meeting was held at the Ida Public Library to address community concerns at the

site.

The Illinois EPA has established an information repository for the MIG/DeWane Landfill at the Ida Public Library in Belvidere, Illinois. Site investigation documents, site related decision documents, the Administrative Record, and the Proposed Plan were placed in the repository. Copies of the Proposed Plan were mailed to interested citizens and groups and were available at the public hearing.

It was determined in late March 1999, that landfill gas had migrated over 750 ft. into a newly developing subdivision. Methane gas was infiltrating homes through basement sump pits and resulted in the recommended the evacuation of several homes. A series of public meetings were held to inform the public of the situation.

A public comment period for the Proposed Plan was held from June 10, 1999 through August 13, 1999 to encourage public participation in the overall remedy selection process. Several requests were received from individuals or groups for an extension. All requested extensions were granted and comments from those parties were due August 27, 1999. The Proposed Plan was released on July 13, 1999. Also, a public hearing for the Proposed Plan was held on July 13, 1999. At this meeting, representatives from the Illinois EPA answered questions about problems at the site and the remedial alternatives under consideration. Several requests were received from individuals or groups for an extension. All requested extensions were granted and comments from those parties were due Friday, August 27, 1999. A response to the comments received during this comment period is included in the Responsiveness Summary, which is part of this Record of Decision.

IV. Scope and Role of Response Action

Presumptive Remedies for CERLCA Municipal Landfills

Since CERCLA/Superfund's inception in 1980, the removal and remedial programs have found that certain categories of sites have similar characteristics, such as types of contaminants present, past industrial use, or environmental media affected. Based on a wealth of information acquired from evaluating and cleaning these sites, Superfund undertook the presumptive remedy initiative to develop remedies that are appropriate for specific site types and/or contaminants. One site category for which the U.S. EPA developed a presumptive remedy is municipal landfills. The U.S. EPA established containment as the presumptive remedy for landfills in September 1993. The containment presumptive remedy includes the following components, as appropriate in a site-specific basis:

- Landfill cap;
- Source area ground-water control to contain plume;

- Leachate collection and treatment;
- Landfill gas collection and treatment;
- Institutional controls to supplement engineering controls.

The overall strategy for cleaning up this Site included a combination of early emergency removal actions conducted under the 1990 AOC, along with interim remedial measures conducted under the 1991 AOC, the recent 1999 emergency response actions, coupled with the final, long-term actions described in this ROD. This strategy is consistent with the presumptive remedies approach identified by the U.S. EPA for municipal landfills.

<u>Early Emergency Removal Actions</u>

In May 1989, the Illinois EPA directed the emergency removal of approximately 80,000 gallons of leachate from the leachate surface impoundment. This action was implemented under State removal authority. This action and later leachate removal actions stopped the leachate from overflowing the impoundment and contaminating property both on-site and off-site. These actions also stopped the leachate from potentially contaminating adjacent intermittent streams and the Kishwaukee River.

In June 1990, the USEPA, after a request from the Illinois EPA, undertook the removal of approximately 75,000 additional gallons of leachate from the surface impoundment. This action was implemented under Federal removal authority.

The leachate surface impoundment berms were repaired and increased in height in November 1990, as was required by the October 29, 1990 Consent Order. This action was undertaken to insure the leachate did not overflow the impoundment and contaminate soil and surface waters.

<u>Interim Remedial Measures</u>

During 1991, the PRPs conducted interim remedial measures to stabilize the Site and mitigate the more than 100 leachate flows coming from the landfill. The measures included:

(1) Backfill and rough grading of the top and side slopes of the landfill to cover exposed refuse and allow for precipitation runoff;

(2) Placement of topsoil (approximately 25,000 cu. yd.) over 90% of the side slopes;

(3) Placement and compaction of soil (approximately 78,000 cu. yd.) onto the top of the landfill for the grading layer, and as an interim compacted 2-foot clay cover;

(4) Placement of 17 settlement plates to monitor landfill settlement;

(5) Sampling of ponded water and sediment located on northern most edge of landfill site;

(6) Removal and sampling of one crushed 55 gallon drum, and adjacent soil from the northern edge of the landfill;

(7) Soil sampling of the agricultural field (later to become the borrow pit soil) west of the landfill; and,

(8) The extension of two gas vents on top of the landfill.

From 1992 to February 1993, the Interim Remedial Measures continued with

(1) Placement and compaction of soil (approx. 90,500 cu. yd.) onto the top of the landfill to complete the grading layer;

(2) Excavation of soil (3,463 cu. yd.) from the leachate contaminated storm water drainage channels on agricultural land adjacent to and north of the site, and backfilling of these areas with soil and topsoil (5,063 cu. yd.);

(3) Removal of approximately 50,000 gals. of ponded storm water from the convergence/confluence of the drainage channels;

(4) Construction of a low permeability, 2-foot clay soil layer on the landfill crest;

(5) Construction of a 6-inch vegetation soil layer of topsoil (38,000 cu. yd.);

(6) Removal of ponded storm water and excavation of sediments from the northern most area of the site and backfilling of the area with soil;

(7) Installation of a site security chain linked fence around the landfill site;

(8) Property boundary site survey;

(9) Rip-rap erosion control installation for storm water runoff north of the site;

(10) Seeding, mulching, and erosion control measures for the interim cap/soil cover; and

(11) Relocation of the C&NW (Railroad) Transportation Company communication utility line from overhead to below ground on the north side of the tracks at the northern edge of the landfill site.

These capping actions were undertaken to provide additional cover for the landfill wastes. In

addition, the actions reduced the infiltration of precipitation into the landfill thus reducing leachate generation and groundwater contamination. These interim actions were implemented under the authority of the March 29, 1991 Consent Order.

During April 1993, to maintain the required freeboard or safe level of leachate liquids within the surface impoundment, the MLTF removed approximately 181,000 gallons of liquid from the impoundment in April 1993. An additional 78,000 gallons of liquids were removed from the leachate surface impoundment in July 1993. These interim remedial actions occurred under the authority of both the 1990 and 1991 Consent Orders.

Recent Emergency Response Actions

In mid-May 1999, the interception and emergency removal of landfill gas began in the area adjacent to and west of the landfill, and within the subdivision. It was initially determined by the PRPs in late March 1999 that the landfill gas had migrated over 700 ft. into the western most area of the soil borrow pit. The soil borrow pit bordered the eastern boundary of the new Wycliffe Estates subdivision, which was still under going development. In mid-April 1999 the PRPs confirmed the presence of landfill gas and informed the Illinois EPA. The Illinois EPA responded to the potential emergency situation by sampling homes within the subdivision for landfill gas and VOCs. This emergency response action was implemented under the authority of the March 29, 1991 Consent Order.

The Illinois EPA response determined that there was methane gas in the basements and sumps of some of the houses. A short-term evacuation was recommended for a few of the residences, due to flammability conditions that existed in a few of the basement sumps. The Illinois EPA responded with the assistance of the City of Belvidere and Boone County personnel. During the initial emergency the PRPs representatives observed the sampling process. The PRPs and their representatives, at the request of the Illinois EPA, installed landfill gas extractions wells east of the subdivision, a gas interceptor trench immediately West of the landfill, home gas monitors, sump gas evacuation systems, and additional gas/groundwater sampling probes within the subdivision. The landfill gas extraction system was installed and became operation less than one month of the Illinois EPA determining that there was a gas migration problem. Within days of the gas extractions system becoming operational, gas levels began to decline.

Planned Actions

- Construction and operation of a leachate collection, removal and monitoring system.
- Construction and operation of an active and passive landfill gas collection system and monitoring program.
- Leachate surface impoundment closure.

- Surface water diversion system.

- Implementation of access restrictions and institutional controls.

- Natural attenuation of groundwater.

- Long-term groundwater monitoring.

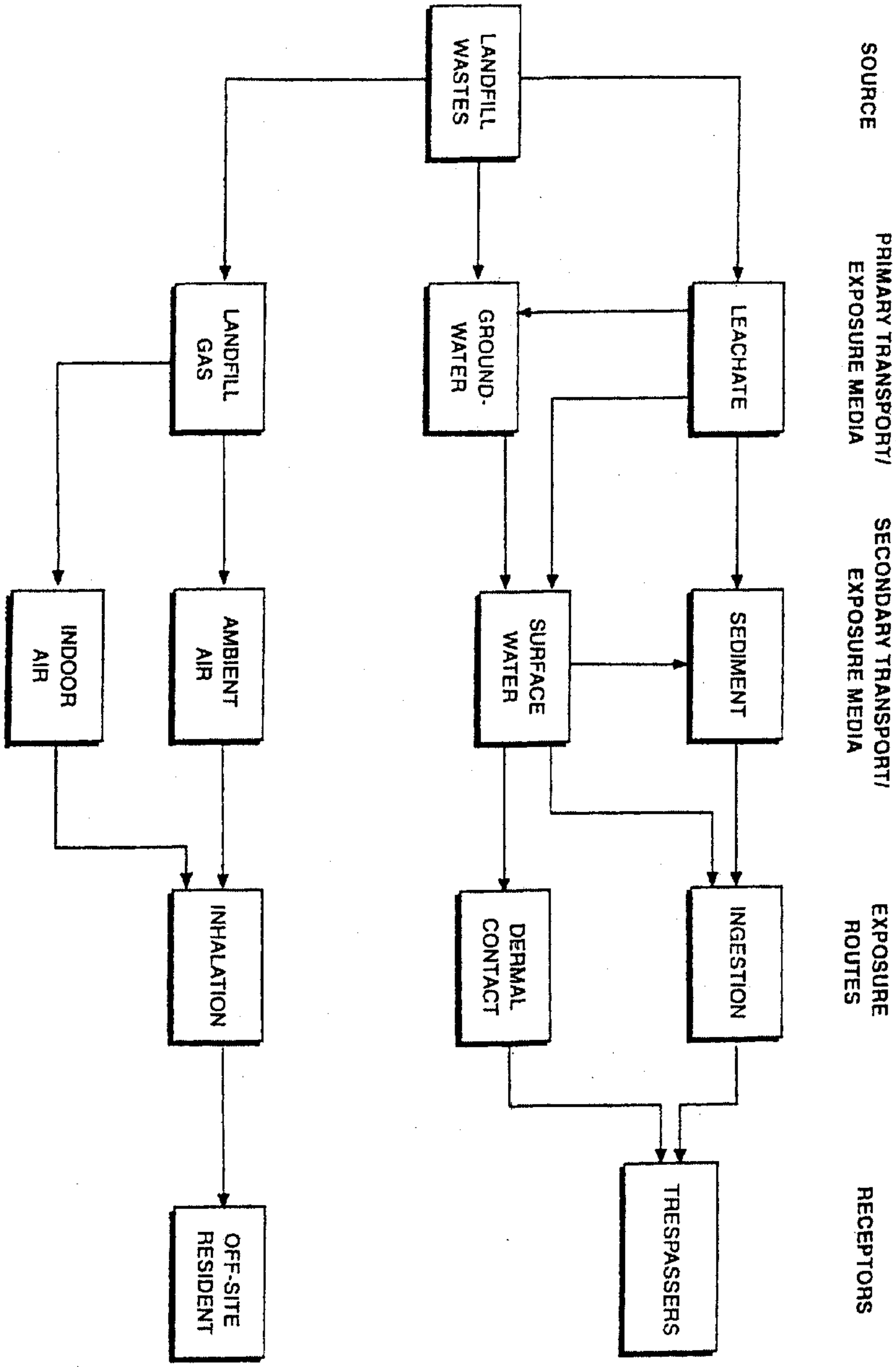
- Construction of a new cap over the entire landfill to minimize the infiltration of precipitation into the landfill.

- Prepare Risk Assessment addendum to address potential risk to Wycliffe subdivision.

The capping of the landfill will effectively reduce groundwater infiltration through the landfill waste, thus reducing the generation of landfill leachate and gas. The landfill gas is presently being actively remediated as mentioned above. Passive gas vents will be placed throughout the landfill crest. Access restrictions and institutional controls will prevent access and exposure to contaminants. The landfill cap and a leachate collection system will result in dramatically reduced contamination to groundwater by contaminants such as VOCs. Contaminants presently in the groundwater and soil are undergoing natural attenuation or intrinsic remediation due to the composition and chemistry of the soil. Cleanup objectives for the Contaminants of Concern in the groundwater will be the Maximum Contaminant Level (MCL) for Class I ground water. These actions will be implemented under the authority of the March 29, 1991 Consent Order.

V. Site Characteristics

The organic and inorganic contaminants identified at the landfill during the RI have several potential pathways by which people may be exposed, if no further remedial action would occur. The most pertinent pathways include direct contact, volatilization and wind dispersal, landfill gas, erosion and runoff, surface water, and groundwater. These pathways are represented graphically below as the site conceptual model.


SOURCE
PRIMARY TRANSPORT/ EXPOSURE MEDIA
SECONDARY TRANSPORT/ EXPOSURE MEDIA
EXPOSURE ROUTES
RECEPTORS
LANDFILL WASTES
LEACHATE
GROUND-WATER
LANDFILL GAS
SEDIMENT
SURFACE WATER
AMBIENT AIR
INDOOR AIR
INGESTION
DERMAL CONTACT
INHALATION
TRESPASSERS
OFF-SITE RESIDENT

- There is a potential for exposure to the contaminants onsite via direct contact with the landfill surface soil, landfill leachate via seeps and sediment, and surface impoundment liquid and sediment. There is also a potential for exposure to contaminants via direct contact with liquid and soil associated with the two intermittent drainage channels in the field located north of the landfill and the intermittent stream sediment and water. As noted in the baseline risk assessment, direct or dermal contact with the soil and water is not expected to be significant and was not evaluated at the site.

- There is a potential for exposure to the contaminants in landfill gas, soils, and sediments via the volatilization and wind pathway to individuals onsite and downwind.

- There is a potential for exposure to the contaminants via the landfill gas pathway to onsite workers who conduct subsurface activities and to offsite areas.

- Erosion and runoff comprise an intermediate transport pathway for contaminants to migrate from the landfill to the two intermittent drainage channels in the field located to the north of the landfill, to the former landfill borrow area south of the landfill, to the intermittent stream east of the landfill; and finally, to the Kishwaukee River.

- There is a potential for exposure to the contaminants via the surface water pathway. Since the Kishwaukee River is not used as a potable water source, the primary receptors for the surface water pathway are aquatic and terrestrial wildlife that come into contact with the waterway. The RI determined that the surface water pathway does not currently serve as an exposure pathway for landfill derived contaminants being transported to surface water receptors.

- The RI had identified two primary groundwater pathways. These groundwater pathways are referred to as the West Glacial Drift Pathway and the North Interface Pathway. Both of these groundwater pathways have no direct receptors since there are no current users of the impacted groundwater downgradient from the landfill and there is no realistic future potential for groundwater use due to institutional controls. Institutional controls such as zoning and health code regulations, do not allow for building houses in the flood plain nor the placement of drinking water wells. Additional institutional controls, such as dede restrictions on the use of this property, will be implemented, if needed to supplement the zoning and health code regulations. The groundwater pathways do comprise an intermediate transport pathway for contaminants to migrate from the landfill to surface water pathways and to future residential indoor air pathways. An examination of the impact of Volatile Organic Compounds (VOCs) migrating along the Western Glacial Drift pathway and then offgassing to future residential basement air was evaluated as part of the baseline risk assessment using conservative contaminant migration and attenuation assumptions. The baseline risk assessment estimated that there might be low part per

billion concentrations of VOCs offgassing from the Western Glacial Drift groundwater that has the potential of posing a risk when coupled with gas migration. The potential exposure to landfill gases and VOCs is being addressed by the installation and start up of the landfill gas interceptor trench and gas extraction using withdraw wells. The baseline risk assessment determined that there may be a potential significant risk of future chronic exposures to residents with homes in or possibly near the soil borrow pit, if no further remedial actions occur. Additional sampling occurred February 2000 to provide updated information for an addendum to the original baseline risk assessment.

Site Size

The MIG/DeWane Landfill occupies an area of approximately 47 acres including an adjacent leachate surface impoundment near the eastern slope of the landfill. The Site and surrounding area lies within the Rock River Hill Country physiographic province of Illinois and the Kishwaukee River Basin. The Rock River Hill Country is physiographic province as characterized by gently rolling topography, which is a result of Pleistocene glaciation that eroded, reshaped, and modified the landscape. The Kishwaukee River is located approximately 1,000 feet north of the landfill. The westward flowing Kishwaukee River and its tributaries drain most of Boone County. The Kishwaukee River is a major tributary to the Rock River, which is, located about 15 miles west of the city of Belvidere.

The regional topography is controlled mainly by bedrock, which is generally within 50 feet of the ground surface. Regionally, ground surface elevations in Boone County range from about 1,000 feet above Mean Sea Level (MSL) in northern Boone County to just below 700 feet above MSL along the Kishwaukee River in the south. The maximum ground surface elevation in the study area is approximately 850 feet MSL. The minimum ground surface elevation in the borrow pit west of the landfill is approximately 790 feet above MSL.

The landfill rises to a height of approximately 50 to 55 feet above the surrounding terrain. The landfill is bounded on the north by the Chicago and Northwestern railroad tracks and the Commonwealth Edison right-of-way. Agricultural and commercial properties are located to the east and south of the landfill. A soil borrow pit, used to provide soil for the interim landfill cap, abuts the west side of the landfill. Approximately 750 feet west of the landfill is a residential housing development.

Surface and Subsurface Features

As stated above, the 47-acre landfill rises to a height of approximately 50 to 55 feet above the adjacent land surface and even higher above the adjacent soil borrow pit to the west. The estimated volume of waste within the landfill is approximately 3,715,200 cubic yards.

There are no known "hot spots" areas of highly toxic and/or mobile source material that represent principal threat waste). Historical records and physical evidence do not document any

discrete subsurface disposal areas. The existing leachate collection system was designed to allow gravity drainage of leachate from the landfill to a single leachate lagoon (surface impoundment). The majority of the leachate collection drain system was installed in the clay lined former gravel pit. The base of fill / top of sandy till in areas located west of the former gravel pit were designed to slope at a 1 % grade from west to east towards the leachate collection system.

Remedial Investigation Sampling Strategy

The primary objective of the RI is to evaluate the presence, nature, and extent of landfill contaminants in various media in the Site study area. RI field activities were conducted during the following investigation events: Round 1 (May 1993 to November 1993), Round 2 (October 1994 to January 1995, Round 3 (July 1995 to September 1995), Round 4 (November 1995), and the Supplemental Waste Delineation Survey (September 1996 to October 1996). RI field efforts included the following tasks:

- Installation of landfill leachate wells and gas probes.
- Geophysical and soil boring delineation survey and a supplemental waste delineation survey to define the limits of the refuse disposal.
- Surface impoundment geotechnical survey to evaluate its structural integrity.
- Ambient air survey to evaluate the landfill's emission of volatile organic compounds (VOCs) and methane.
- Collection of leachate well liquid, leachate seep liquid and sediment, surface impoundment liquid and sediment, and gas probe vapor samples.
- Advancement of 53 soil borings and installation of 27 monitoring wells.
- Characterization of study area meteorology, surface water, soil, geology, and hydrogeology.
- Ecological investigation that included a wetland delineation survey, ecological field survey, demographic survey, and a land use survey.
- Collection of surface soil, vadose zone soil, and phreatic zone soil samples.
- Collection of groundwater samples from four residential well and 27 monitoring wells.
- Collection of surface water and sediment samples from the intermittent stream and the Kishwaukee River.

Nature and Extent of Contamination

During the RI, samples were taken from the potential source areas and the potential migration pathways at the Site. The sources include the landfill, landfill gas, leachate surface impoundment, leachate, and the media include groundwater, surface water, soil, leachate, gas/air and sediments. Additionally, groundwater from four, off-site private supply wells were sampled to assess potential impacts from the Site related wastes.

The inorganic and organic contaminants identified during the RI have several potential fate and transport pathways. The propensity for migration of inorganics from the source areas is more limited than for the organics. Migration of inorganics is limited because the contaminants is likely to undergo reactions such as bonding with clay through adsorption or ion exchange; or bonding with organic materials by complex reactions. Semi-Volatile Organic Contaminants (SVOCs) migrate more readily than inorganics; however, their relatively low solubilities inhibit their transport rate. VOC contaminants are typically the most mobile and have the potential to migrate as a liquid and a gas. Various migration pathways are possible; however, some pathways are more probable based on the physical characteristics and analytical data collected during the RI. The most pertinent pathways are direct contact, volatilization and wind, landfill gas, erosion and runoff, surface water, and groundwater.

Contaminant Source

The major source of contamination is the 47-acre landfill itself and, to a lesser extent, the leachate surface impoundment. An estimated 3,700,000 cubic yards of waste is in currently occupying the landfill. The main COCs for the site include organic compounds vinyl chloride, methylene chloride, 1,1-dichloroethene, 1,2-dicholopropane, tricholorethene, benzene and tetrachloroethene. In addition, the following inorganic compounds are antimony, arsenic, chromium, iron, lead, manganese, mercury, nickel and boron. These compounds were detected in groundwater monitoring wells, during the RI, at levels that meet or exceed regulatory groundwater standards.

Groundwater flows predominately to the north and to a lesser extent northwest. Two principal horizontal groundwater flow paths exist within the Glacial Drift aquifer. One path is north of the Kishwaukee River and one path is south of river and west of the landfill. South of the Kishwaukee River in the immediate vicinity of the landfill, groundwater flow in the Glacial Drift aquifer occurs predominantly west of the landfill in the sand and gravel lens encountered at boring locations MW03, MW13, and MW14 (Till/Sand Lens Zone). Groundwater flows through this sand and gravel lens in a northwesterly direction. Based on the RI data, the Glacial Drift aquifer located along the north flank of the landfill does not appear to serve as a principal groundwater flow pathway.

Contaminated Media

Media of concern include leachate, leachate sediments, soil, landfill gas, surface water, and groundwater. Landfill leachate containing various chemicals is generated from the infiltration of precipitation into the landfill. It is the landfill leachate that appears to be responsible for the contamination of the other media. The landfill gas contains many of the COCs designated as VOCs. All of the COCs identified by the baseline risk assessment, both those that exceed and those that do not exceed the MCL include:

VOCs: Acetone, Benzene, Chlorobenzene, Chloroethane; 1,1-Dichloroethane; 1,1-Dichloroethene; 1,2-Dichloropropane, Ethybenzene, Methane, Methylene Chloride, Tetrachloroethene, Toluene; 1,1,2-Trichlorethane, Tricholoethene, and Vinyl Chloride.

SVOCs: Benzo(A)Pyrene and 4-Methylphenol.

Pesticides/PCBs: Dieldrin and Endrin Aldehyde.

Inorganics: Antimony, Arsenic, Beryllium, Iron, Lead, and Manganese.

Landfill Gas

Six gas probes were installed atop the landfill during the RI (since then another 12 probes have been installed within or near the Wycliffe subdivision). The results of two RI rounds of gas probe vapor sampling indicated the presence of numerous VOCs at concentrations greater than 1,000 part per billion volume (ppbv). These VOCs include: chloroethane (6,500 ppbv), acetone (1,600 ppbv), 1,1-Dichloroethane (2,800 ppbv), 2-Butanone (1,200 ppbv), Toluene (20,000 ppbv), ethylebenzene (5,500 ppbv), xylenes (13,000 ppbv). Also, the following contaminants were detected at concentrations between 50 and 1,000 ppbv: methylene chloride (640 ppbv), benzene (330 ppbv), tetrachloroethene (89 ppbv), vinyl chloride (700 ppbv), 1,1,1-trichloroethane (841 ppbv), trichloroethene (360 ppbv), and chlorobenzene (640 ppbv). Methane was detected in gas probe vapor at concentrations ranging from 10 to 50%.

Leachate

Leachate liquid sample were collected during two RI sampling rounds from two leachate wells atop the landfill, 25 major leachate seep locations around the perimeter of the landfill, and the surface impoundment. Leachate sediment samples were collected during two RI sampling rounds from 27 major leachate seep locations around the perimeter of the landfill and from the bottom of the surface impoundment. The analytical results from leachate liquid and sediment samples indicate the presence of eight VOCs and five semi-volatile organic compounds (SVOCs) at concentrations above 1 part per million (1 ppm).

Analytical results for leachate liquid samples indicate the presence of 11 inorganic analytes

detected in concentrations above background surface water and groundwater quality levels. Analytical results from leachate sediment samples indicate the presence of inorganic analytes in leachate seep sediment and surface impoundment sediment samples; however, the concentrations detected are less than the U.S. EPA's Generic Soil Screening Levels (SSLs).

Soil

Surface and shallow subsurface soil sample were collected once during the IRM activities from 10 locations along the two intermittent drainage channels located in the field directly north of the landfill. Surface soil, vadose zone soil, and phreatic zone soil samples were collected during one RI sampling round. Surface soil samples were collected from 10 locations inside the perimeter of the landfill fence and from nine locations outside the perimeter fence. At total of 14 vadose zone soil samples were collected from eight soil borings located south of the Kishwaukee River. Phreatic zone soil samples were collected from nine soil borings located south of the Kishwaukee River and from one soil boring north of the river.

The analytical results for soil samples collected inside the perimeter of the landfill fence indicate the presence of VOCs, SVOCs, pesticides, polychlorinated biphenyls (PBCs), and inorganic analytes. All of the VOCs detected in soil were also detected in leachate seep sediment samples; however, concentrations in the soil were much lower than those detected in the sediment. Several VOCs were detected in the sediment, but not detected in the soil. Many of the same SVOCs were detected in both surface soil and sediment. The concentrations were similar in both surface soil and sediment except for 4-methylphenol, which was detected at higher concentrations in sediment. Trace to low concentrations of organic and inorganic constituents were detected in soil samples collected outside the fenced landfill perimeter. The presence of low level pesticide concentrations detected outside of the landfill perimeter fence is not attributed to the landfill, but to the surrounding agricultural land use.

Analytical results from the IRM and RI soil sampling activities indicate that the soil outside the fenced landfill source area has not been impacted by landfill source area constituents.

Residential Well Groundwater

Residential well groundwater samples were collected twice during the RI from four locations. Residential well groundwater samples had no detectable concentrations of VOCs, SVOCs, pesticides, and PCBs. Except for nitrate+nitrite, the detected concentrations of inorganic analytes in residential well samples are typical of regional groundwater and were not above any regulatory groundwater standards. Tow of the residential well samples contained concentrations of nitrate+nitrite that were above its regulatory groundwater standard. The presence of nitrate+nitrite can be attributed to the application of fertilizers and the long history of farming activities that have occurred at these locations.

Monitoring Well Groundwater

Monitoring well groundwater samples were collected during four RI sampling rounds from 27 monitoring wells. VOC, SVOC, and levels of inorganic analyte and wet chemistry parameter constituents above background quality have been identified in the groundwater on the north and west sides of the landfill. Concentrations of six VOCs, six inorganic analytes, and two wet chemistry parameters that may be attributable to the landfill are above Class I groundwater quality criteria.

Surface Water and Sediments

Surface water and sediment samples were collected from the intermittent stream system and the Kishwaukee River on during three RI field sampling events to characterize the chemical composition of surface water and associated sediment in the study area. Surface water and sediment sampling took place during Rounds 1, 2, and 4 field activities. The surface water and sediment sample were collected from four locations along the intermittent stream. Two VOCs were detected in one intermittent stream surface water sample. Carbon disulfide and toluene were detected at respective concentrations of approximately 3 J ug/L and 2 J ug/L. Three SVOCs were detected in intermittent stream water samples. Di-n-butylphthalate, 4-methylphenol, and bis(2-ethlyhexyl)phthalate were detected a concentration of 2 J ug/L, 3 J ug/L, and 4 J ug/L, respectively. Three VOCs and seventeen SVOCs were detected in intermittent stream sediment samples. The three VOCs acetone, 2-butanone, and toluene were detected at the respective concentrations of 9 and 100 J ug/kg, 33 ug/kg, and 2 J ug/kg. Seventeen SVOCs were detected in intermittent stream sediment samples. The seventeen detected SVOCs consisted of 4-methylphenol, two phthalates, and fourteen PAHs. The detection levels for the seventeen chemicals varied at four sample locations. Also detected were nine pesticide compounds at relatively low concentrations. The intermittent stream receives runoff from agricultural fields. The pesticides are indicative of past and current agricultural land use in the area. Two PCB compounds were detected at low concentrations in intermittent stream sediment samples.

Surface water and sediment samples were collected from fifteen locations along the Kishwaukee River. A few VOCs were detected in Kishwaukee River sediment samples. Three SVOCs were detected in Kishwaukee River sediment samples. No pesticides were detected in Kishwaukee River sediment samples. Three VOCs were detected in Kishwaukee River surface water samples. Two SVOCs were detected in Kishwaukee River surface water samples. No pesticides or PCBs were detected in the Kishwaukee River surface water samples.

VI. Current and Potential Future Site and Resource Uses

Land Uses:

The current on-site land use, is now and has been for the past 30 years, that of a landfill. The present landfill, however, has not been in operation since 1988. Access to the landfill has already been restricted through construction of a security fence around the entire perimeter of the Landfill with locking gates. Institutional controls at the local level will be needed to prevent human exposure to risks associated with the buried refuse at the Site and leachate constituents present in groundwater.

Offsite groundwater is also impacted by migration of contaminants from the site. Institutional controls are already in place to restrict the use of offsite groundwater by current residential homes to the west of the Landfill. On February 7, 1994, the City of Belvidere (City) annexed the residential development property west of the IRM borrow pit. The IRM borrow pit is located west of the Landfill, and was identified as a potential downgradient receptor point for both impacted groundwater and landfill gas migration to the west. As part of the annexation agreement (Agreement Numbers 5 and 6), the City agreed to provide sanitary and water service to the annexed property. Consequently, water supply wells have not been, and will not be, installed within the residential area to the west, thus removing offsite groundwater as a current human exposure pathway. The landfill property will require deed restrictions. Although groundwater use in the agricultural field north of the landfill is limited by flood plain zoning restrictions and Boone County Health Department, the need for deed restrictions will be considered. Baseline sampling during the Remedial Design/ Remedial Action activities will be used to evaluate the need for more specific institutional controls.

The property to the north of the Site is identified on the Boone County Zoning Map as a floodplain and has a special use land use designation. Given the identification of this property as a floodplain on the county's zoning map, as well as its lack of access to existing roads, it is not feasible that the property north of the Site can be developed for residential purposes. This property has been used for agricultural purposes in the past.

Adjacent and surrounding land use off-site include the adjacent soil borrow pit, two residential developments, a few small businesses, and agricultural fields. Immediately to the west and adjacent to the landfill is a soil borrow pit. Approximately 700 feet to the west is a residential development. To the north, east, and south of the Site are agricultural fields. There are twelve water wells within one-half mile of the Site. There are no wells being impacted by the landfill, downgradient of Site. Broken down into percentages, the land use in this one-half mile radius of the Site is:

- 47% Agricultural
- 19% Developed (commercial and residential)
- 10% Wooded

- 5% Landfill
- 5% Wetlands
- 4% Planned future development (presently agricultural)
- 4% Commercial waste water discharge field
- 2% Waste fields and roadsides
- 2% Borrow field
- 2% Kishwaukee River and tributaries

Groundwater and Surface Water Uses:

Current ground/surface water use on the Site and the vicinity is limited to the use of the Kishwaukee River for recreation and fishing. The groundwater in the vicinity of the Site is classified as a Class I aquifer. Potential and future use of groundwater is restricted at and in the area of the Site due to local zoning and health department restrictions, and to the extent further restrictions may be needed they will be addressed after completion of the RD/RA baseline sampling.

Institutional controls are already in place to restrict the use of offsite groundwater by current residential homes to the west of the Landfill. On February 7, 1994, the City of Belvidere (City) annexed property west of the IRM borrow pit for residential development. The IRM borrow pit is located west of the Landfill, and was identified as a potential downgradient receptor point for both impacted groundwater and landfill gas migration to the west. As part of the annexation agreement, the City agreed to provide sanitary and water service to the annexed property. Consequently, water supply wells have not been, and will not be, installed within the residential area to the west, thus removing offsite groundwater (drinking water) as a current human exposure pathway. Per the Boone County Health Department, a permit to install a water-well will not be issued if municipal water is provided by the City. A deed restriction has been placed on the IRM borrow pit property, which restricts the use of this property. This restriction prohibits future residential development.

The groundwater at the Site and in the areas immediately adjacent to the Site is not used as a drinking water source. Private, drinking wells do exist north of the Kishwaukee River, but groundwater flow north of the river is south towards the river.

Groundwater batch flushing model analysis and the groundwater flow path analysis were integrated to develop time frame estimates for monitored natural attenuation to attain Illinois

Class I groundwater quality criteria for the various scenarios that were evaluated. It should be noted that alternative groundwater pump and treat or containment approaches, the other remedial actions that can be considered for offsite groundwater, would not be any more effective as monitored natural attenuation for the Site. The time frame required for monitored natural attenuation to reach Illinois Class I groundwater quality criteria for the West Glacial Pathway is estimated to range from 13 to 26 years. This groundwater pathway is west-northwest under the soil borrow pit and part of the Wycliffe subdivision and then northwest towards the Kishwaukee River. Residents within the subdivision are connecting to Belvidere city water. The time frame is the same for the contingent leachate removal scenario.

The time frame required for natural attenuation to reach Illinois Class I groundwater quality criteria of the North Interface Pathway under the planned leachate removal scenario is estimated to range from 81 to 108 years. Whereas the time frame under the contingent leachate removal scenario with active groundwater withdraw is estimated to range from 54 to 81 years. The North Interface Pathway for groundwater is directly north from the landfill towards the river.

The groundwater for this pathway runs under an agricultural field that is within the Kishwaukee flood plain. The property to the north of the Site is identified on the Boone County Zoning Map as a floodplain and has a special use land use designation. In accordance with Section 17.12 of the Boone County Zoning Ordinance, no development can be allowed below the base flood elevation for the "Special Flood Hazard Area" (SFHA) that would create a damaging or potentially damaging increase in flood heights or velocity or threat to public health and safety. Section 17.3 of the Boone County Zoning Ordinance defines the base flood elevation for the SFHA of the Kishwaukee River as the 100-year floodplain. Given the identification of this property as a floodplain on the county's zoning map, as well as its lack of access to existing roads, it is not feasible that the property north of the Site can be developed for residential purposes.

A total of eight municipal wells provide potable water to the City of Belvidere. The closest municipal well to the landfill is municipal well No. 7. This well is located approximately 4,000 feet southwest of the landfill. The residential subdivisions on the west and south side of the study area are connected to the City of Belvidere municipal water supply system. The closest residential well to the landfill is located about 1,500 feet to the north of the landfill. The well is located north of the Kishwaukee River where groundwater flow is southward, towards the river. Currently, there are no municipal, domestic, or commercial wells located downgradient of the landfill (between the landfill and the Kishwaukee River). Future land use analysis indicates that there is no potential for a municipal, domestic, or commercial well to be installed in the area.

VII. Summary of Site Risks

Baseline Risk Assessment (Human Health and Ecological Assessments)

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Some remedial action is therefore warranted.

The baseline risk assessment contains both baseline human health and ecological risk assessments. The risk assessments have been prepared to evaluate the potential for adverse effects and significant risks to human and ecological receptors at and in the vicinity of the MIG/DeWane Landfill in Belvidere, Illinois. The baseline risk assessment occurred after the interim response actions were completed, and during and after the RI was completed. Information from the RI was used to complete the RI Report and the baseline risk assessment. The possible risks associated with the site are those that are present or may occur even though an interim cap is in place, and no further action occurs to remediate the site. The baseline risk assessment for MIG/DeWane is a document titled, *Final Report Human Health and Ecological Risk Assessment for the MIG/DeWane Landfill* (March 1997). Both assessments use site-related chemical concentrations, exposure potential, and toxicity information to characterize potential risks to human health and the environment.

Summary of Human Health Assessment

The baseline risk assessment estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this site.

The human health assessment portion of the baseline risk assessment evaluated both current and future risks to trespassers and offsite residents associated with exposure to soil sediment, surface water, and landfill gas via indoor and outside air. The risk assessment characterized contaminants and the potential exposures in the absence of remediation in order to determine which risks need to be reduced or eliminated.

The baseline risk assessment concluded that if no remediation occurs at the site a potential significant risk to human health may exist at the site associated with the following exposure pathways: (1) acute exposures to the surface impoundment; and (2) future chronic exposure to residents with homes near the borrow pit to the west of the landfill. Acute exposures are generally those that occur from high levels of contaminant exposure over a short period of time. Chronic exposure are generally those that occur from low levels of contaminant exposure over a long period of time.

The baseline risk assessment included both qualitative and quantitative evaluations of risk. Three human health exposure scenarios were evaluated quantitatively: (1) child trespasser; (2) a current residential scenario; and (3) a future residential scenario. Chronic exposures were evaluated for all three receptors, while an acute exposure scenario was investigated for the child trespasser accidentally falling into the surface impoundment.

The U.S. EPA has established a target risk range of 1 x 10^{-4} (one in ten thousand) to 1 x 10^{-6} (one in a million) excess-lifetime Cancer Risk. For noncarcinogens, a Hazard Index is calculated. Remedial action is considered warranted for environmental media having a lifetime cancer risk greater than 10^{-4} or a hazardous index greater than 1.

One critical exposure pathway for the trespasser is an acute ingestion exposure of water and sediment during an accidental fall into the leachate water surface impoundment. Iron in the impoundment sediment is the chemical that drives the risk for the pathway for the trespasser. The hazardous index for the sediment is 1.0. Iron also drives the risk above the threshold level in the incidental ingestion pathway of leachate surface impoundment water. The hazardous index for the leachate surface impoundment sediment is 5.8.

Indoor air exposures by inhalation of landfill gas and groundwater volatiles pose a potential significant risk to future residents if they were to build in or near the soil borrow pit area to the west of the landfill site, and no further remediation occurs. The cancer risk for future residents is 1.1 x 10^{-3}. Chlorobenzene and toluene are the chemicals that drive the noncarcinogenic risk in this scenario. Benzene and vinyl chloride drive the carcinogenic risk. This scenario is considered reasonable given the proximity of some residences to the western boundary of the soil borrow pit area. Additional sampling of for landfill gas, and for VOCs has recently occurred in February 2000. The new sampling information will be used to update the baseline risk assessment.

In addition to the above mentioned risks, landfill methane concentrations were previously determined by the baseline risk assessment to being a risk to public safety, due to flammability, should development occur in soil borrow pit which is located adjacent to and west of the landfill. Recent new information from April 1999, also determined that methane gas presented a possible flammability risk for those individuals living in the eastern area of the subdivision. The methane and landfill gas risks have been greatly reduced due to the installation and startup in May 1999 of a landfill gas extraction system and interceptor trench within the soil borrow pit area.

Groundwater, although contaminated, was eliminated as a complete critical contaminant pathway due to institutional controls (i.e., zoning and health regulations) there should not be any contact with or consumption of the contaminated groundwater. Local residents use water supplied by the city. Local regulations and zoning prohibited the installation of private drinking wells. These institutional controls are necessary to prevent human contact with the contaminated groundwater, thus eliminating the current human groundwater risk. The Illinois EPA, and the PRPs determined that zoning laws and other regulations would not allow for the installation of private drinking wells on-site or areas off-site that were contaminated. The installation of a new landfill cap will further protect the groundwater from infiltration and precipitation-generated leachate. There is not a current completed pathway. However, the groundwater path is considered a potential drinking water source and there is the potential for future migration of contaminants through groundwater to surface water. The groundwater will therefore need to be remediated.

Section 1: Chemicals of Concern (COCs) for the Human Health Assessment

The main COCs for the site include organic compounds vinyl chloride, methylene chloride, 1,1-dichloroethene, 1,2-dichloropropane, tricholorethene, benzene and tetrachloroethene. In addition, the following inorganic compounds are included: antimony, arsenic, chromium, iron, lead, manganese, mercury, nickel and boron. These compounds were detected in groundwater monitoring wells, during the RI, at levels that meet or exceed regulatory groundwater standards. The tables below show the maximum concentrations detected of VOCs and SVOCs in the leachate and groundwater monitoring wells.

TABLE 4-1

MAXIMUM CONCENTRATION OF VOCS DETECTED

IN SOURCE AREA MEDIA

MIG/DeWane Landfill

Belvidere, Illinois

SOURCE AREA MEDIA

	VOCS WITH MAXIMUM DETECTED CONCENTRATIONS X > 1,000 ug/L, ug/kg, or ppbv	Leachate Well Liquid ug/L	Leachate Seep Sediment ug/kg	Leachate Seep Liquid ug/L	Surface Impoundment Liquid Ug/L	Surface Probe Sediment ug/kg	Gas Vapor Ppbv
004.	Chloroethane	U	U	64	U	U	6,500
005.	Methylenechloride	U	12,000	3,200	53 J	U	640
006.	Acetone	17,000	13,000	17,000 J	6,600	1,400 J	1,600
009.	1,1-Dichloroethane	U	720 J	190 J	U	U	2,800
013.	2-Butanone	46,000	22,000	39,000 J	3,700	U	1,200
022.	Benzene*	11 J	1,500	17 J	U	U	330
027.	Tetrachloroethene*	U	2,100 J	420 J	U	U	89
029.	Toluene	1,000	5,200 J	1,200	210 J	70 J	20,000 E
031.	Ethylbenzene	190	4,500	110	U	980 J	5,500
033.	Xylenes (Total)	660	36,000	380	120 J	5,000	13,000

SOURCE AREA MEDIA

	VOCS WITH MAXIMUM DETECTED CONCENTRATIONS 10 < X < 1,000 ug/L, ug/kg, or ppbv	Leachate Well Liquid ug/L	Leachate Seep Sediment ug/kg	Leachate Seep Liquid ug/L	Surface Impoundment Liquid ug/L	Surface Probe Sediment ug/kg	Gas Vapor Ppbv
003.	Vinylchloride*	6 J	U	U	U	U	700
007.	Carbondisulfide	U	U	U	U	19 J	U
014.	1,1,1-Trichloroethane	U	U	U	U	U	841
019.	Trichloroethene*	U	350 J	340 J	U	U	360
025.	4-Methyl-2-Pentanone	430	250 B	160 J	340 J	U	U
026.	2-Hexanone	39 J	870	U	U	U	U
030.	Chlorobenzene	U	U	11 J	U	U	640

—bNOTES: ug/L = microgram per liter or part per billion (ppb).

ug/kg = microgram per kilogram or part per billion (ppb).

ppbv = part per billion volume (ppbv).

* = This VOC was detected in monitoring well groundwater samples at concentrations above above regulatory groundwater standards.

J = Reported result is quantitatively estimated.

U = Not detected.

B = Constituent also present in laboratory blank.

E = Constituent concentration exceeds the value listed.

TABLE 4-2

MAXIMUM CONCENTRATION OF SVOCS DETECTED IN SOURCE AREA MEDIA

MIG/DeWane Landfill

Belvidere, Illinois

	SOURCE AREA MEDIA					
SVOCS WITH MAXIMUM DETECTED CONCENTRATIONS X > 1,000 ug/L, or ug/kg		Leachate Well Liquid ug/L	Leachate Seep Sediment ug/kg	Leachate Seep Liquid ug/L	Surface Impoundment Liquid Ug/L	Surface Impoundment Sediment ug/kg
034.	Phenol	3,400J	12,000J	7,100J	2,400J	U
042.	4-Methylphenol	20,000J	76,000	12,000J	4,200J	2,100J
052.	Napthalene	48J	1,200 J	20J	U	660J
080.	Phenanthrene	U	2,700 J	4J	U	200J
090.	Bis(2-ethylhexyl)phthalate	12J	320J	U	U	3,900

	SOURCE AREA MEDIA					
SVOCS WITH MAXIMUM DETECTED CONCENTRATIONS 10 < X< 1,000 ug/L or ug/kg		Leachate Well Liquid ug/L	Leachate Seep Sediment ug/kg	Leachate Seep Liquid ug/L	Surface Impoundment Liquid ug/L	Surface Impoundment Sediment ug/kg
038.	1,4-Dichlorobenzene	32J	U	7J	U	U
040.	2-Methylphenol	11J	U	U	U	76J
046.	Isophorone	11J	U	U	U	U
048.	2,4-Dimethylphenol	55J	U	14J	U	U
055.	4-Chloro-3-methylphenol	U	U	42J	U	U
056.	2-Methylnaphthalene	300	U	22J	U	U
066.	Acenaphthene	U	58J	U	U	U
071.	Diethylphthalate	35J	530J	22	160J	96J
073.	Fluorene	U	70J	U	U	180J
076.	N-Nitrosodiphenylamine	U	U	U	U	120J
079.	Pentachlorophenol	U	190J	U	U	U
082.	Carbazole	79J	53J	U	U	160J
083.	Di-n-butylphthalate	U	U	U	U	88J
084.	Fluoranthene	10J	120J	U	U	470J
085.	Pyrene	11J	91J	U	U	370J
086.	Butylbenzylphthalate	U	U	U	U	180J
088.	Benzo(a)anthracene	U	U	U	U	190J
089.	Chrysene	U	U	U	U	220J
091.	Di-n-octylphthalate	U	U	U	U	460J
092.	Benzo(b)fluoranthene	U	44J	U	U	170J
093.	Benzo(k)fluoranthene	U	U	U	U	190J
094.	Benzo(a)pyrene	U	U	U	U	180J
095.	Indeno(1,2,3-c,d)pyrene	U	U	U	U	110J
097.	Benzo(g,h,i)perylene	U	U	U	U	82J

NOTES: ug/L = microgram per liter or part per billion (ppb).

ug/kg = microgram per kilogram or part per billion (ppb).

J = Reported result is quantitatively estimated.

U = Not detected.

The RI investigation involved sampling soil, leachate, landfill gas, surface water and surface sediments. RI sampling determined that some contaminants in groundwater and leachate exceeded Maximum Contaminant Levels (MCLs). VOCs, SVOCs and inorganic chemical compounds were detected. Because of the presence of these chemicals, an assessment was conducted to estimate the possible health and environmental risks that could result if the contamination in the soil, leachate, sediments, landfill gas, surface water and groundwater were not addressed. The assessment, commonly referred to as the baseline risk assessment, evaluated current and future potential human health and environmental risks from exposure to chemicals associated with the site at the time of the remedial investigation. Other contaminants were identified, but at levels below regulatory standards.

VOCs: Acetone, Benzene, Chlorobenzene, Chloroethane; 1,1-Dichloroethane; 1,1- Dichloroethene; 1,2-Dichloropropane, Ethybenzene, Methane, Methylene Chloride, Tetrachloroethene, Toluene; 1,1,2-Trichlorethane, Tricholoethene, and Vinyl Chloride.

SVOCs: Benzo(A)Pyrene and 4-Methylphenol.

Pesticides/PCBs: Dieldrin and Endrin Aldehyde.

Inorganics: Antimony, Arsenic, Beryllium, Iron, Lead, and Manganese.

Contaminated Media

Media of concern includes leachate, leachate sediments, soil, landfill gas, surface water, and groundwater. Landfill leachate containing various chemicals is generated from the infiltration of precipitation into the landfill. It is the landfill leachate that appears to be responsible for the contamination of the other media. The landfill gas contains many of the COCs designated as VOCs.

Data Usability:

Data usability is the process of determining whether or not the quality of the data generated during the sampling program meets the intended use, in this case for the risk assessment purposes. Important data usability issues evaluated in a risk assessment include: (1) data sources; (2) sampling procedures; (3) analytical methods and detection limits; (4) data quality

indicators; and (5) data review and validation.

Uncertainty Analysis:

Certain assumptions underlying any human health risk assessment introduce uncertainty into the results and conclusions. To compensate for uncertainty surrounding input varibles, conservative assumptions are often made which tend to overestimate rather than underestimate risk. In general, assumptions made throughout the risk assessment for this site are conservative in that they do tend to overestimate exposure and resultant health risks rather than underestimate them.

Three sources of uncertainty were identified in pursuit of the Human Health Risk Assessment:

- Scenario uncertainty-- This category includes errors resulting from missing or incomplete information needed to fully define exposure and dose. This may include errors in site information, professional judgement, assumptions regarding exposed populations, and steady-state conditions.

- Parameter uncertainty—Sources of parameter uncertainty include measurement and sampling errors, inherent variability in environmental and exposure-related parameters, and the use of generic surrogate data when site-specific data are not available.

- Model uncertainty—Model uncertainty is often an outgrowth of parameter uncertainty. One source of modeling uncertainty is relationship errors, such as errors in correlations between chemical properties. Errors due to the use of mathematical or conceptual models as simplified representations of reality are also sources of modeling uncertainty.

The uncertainties are presented in the following table.

ASSUMPTION	POTENTIAL MAGNITUDE FOR OVER-ESTIMATION OF RISK	POTENTIAL MAGNITUDE FOR UNDER-ESTIMATION OF RISK	POTENTIAL MAGNITUDE FOR OVER OR UNDER ESTIMATION OF RISK
I. Chemical Data Base			
Representativeness of characterization data base			Low
Treatment of nondetect values			Medium
Exclusion from risk assessment of compounds detected at less than 5% frequency of detection		Medium	
Exclusion from risk assessment of compounds detected at less than naturally occurring background concentrations		Low	
Exclusion from risk assessment of compounds detected that are essential nutrients		Low	
Use of unfiltered, not filtered intermittent stream sampling results	Low		
II. Toxicity Assessment			
Exclusion from risk assessment of compounds with no toxicity information available		Low	
Use of provisional chronic reference dose for iron			Medium
Substituting chronic toxicity values for acute values when no acute values exist	Medium		
Use of upper-bound cancer slope factors to evaluate risks	Medium		
Use of RfDs which incorporate uncertainty factors evaluate risks	Medium		

ASSUMPTION	POTENTIAL MAGNITUDE FOR OVER-ESTIMATION OF RISK	POTENTIAL MAGNITUDE FOR UNDER-ESTIMATION OF RISK	POTENTIAL MAGNITUDE FOR OVER OR UNDER ESTIMATION OF RISK
Frequency of exposure to each medium	Medium		
Duration of exposure	Medium		
Soil ingestion rate			Low
Exposure to contaminants remaining constant over exposure period	Medium		
Exclusion of dermal exposure from Evaluation		Low	
Substituting maximum concentration as EPC	Medium		
Use of models to eliminate air exposure point concentrations			Medium
Body weight			Low
IV. Risk Characterization			
Risk additivity Carcinogens non-carcinogens			 Medium Medium

Nature and Extent of Contamination

The contaminants of concern in the various media at the MIG/DeWane landfill RI study area are as follows:

- Ambient air survey data indicate that VOCs and methane have been detected across the landfill surface at relatively low but variable concentrations.
- Gas probe results indicate the presence of 7 VOCs, in landfill gas at the landfill, at

concentrations greater than 1 ppmv, but less than 21 ppmv. The VOCS included chloroethane, acetone, 1,1-dichloroethane, 2-butanone, toluene, ethylbenzene, and xylenes. Eight other VOCs were detected in the gas at maximum concentrations between 0.5 ppmv and 1 ppmv. The 8 VOCs were vinyl chloride, methylene chloride, 1,1,1-trichloroethane, trichloroethene, benzene, tetrachloroethene, chlorobenzene, and cis-1,2-dichloroethene. Methane was detected in gas probe vapors at concentrations ranging from 10 percent to 50 percent of the total volume of landfill gas.

- Gas probe results for the 6 gas probes installed in March 1999 along the western edge of the landfill soil borrow pit indicate the presence of methane gas in 5 of the 6 gas probes. Readings from the 6 gas probes installed in the nearby subdivision ranged from 0 percent to 54 percent of the total volume of gas.

- Results from the leachate seep sediment sampling detected the presence of 8 VOCs and 13 Semi-VOCs (SVOCs). The VOCs include acetone, 2-butanone, toluene, and xylene with respective maximum concentrations of 13 ppm, 22 ppm, 5.2 ppm and 36 ppm. Also, the VOCs included methylene chloride, benzene, tetrachloroethene, and ethylbenzene which were detected with respective maximum concentrations of 12 ppm, 1.5 ppm, 2.1 ppm, and 4.5 ppm. The 13 SVOCs were detected in leachate seep sediment. Phenol and 4-methylphenol had respective maximum concentrations of 12 ppm and 76 ppm. Napthalene and phenanthrene were detected at concentrations of 1.2 ppm and 2.7 ppm, respectively. Nine other SVOCs were detected at concentrations below 1.0 ppm.

- Nine pesticides were detected at low concentrations in leachate seep sediment samples. Only two pesticides were detected at concentrations above .001 ppm or 10 ppb. Dieldrin was detected at a concentration of 11 ppb and methoxychlor was detected at 12 ppb.

- Four PCB compounds were detected at low concentrations in the leachate seep sediment samples. The maximum concentration of the detected PCBs was 180 ppb.

- The sample results from the RI detected in the leachate the presence of 13 inorganic compounds at concentrations above background surface water levels and regulatory groundwater standards.

- Soil sample results from the landfill area detected the presence of VOCs, Semi-VOCS, pesticides, PCBs, and inorganic compounds. All the VOCs detected in soil were also detected in leachate seep sediments; however, the concentrations in the soil were much lower than those detected in the sediment. Several VOCs were detected in soil that were not detected in sediment. Trace to low concentrations of organic and inorganic chemicals were detected in soil samples collected outside, but nearby, the landfill fence perimeter. The presence of low level pesticide concentrations detected outside the fenced perimeter are not attributed to the landfill, but to the surrounding agricultural land use.

- Residential well groundwater samples had no detectable concentrations of VOCs, Semi-VOCs, pesticides, or PCBs. The detected concentrations of inorganic chemicals in the residential well samples are typical of native groundwater and were not above any regulatory groundwater standards. Two of the residential wells did contain concentrations of nitrate/nitrite that were slightly above regulatory standard. The presence of nitrate/nitrite can be attributed to the application of fertilizers and the long history of farming activities that have occurred at these locations.

- Groundwater monitoring well samples detected concentrations of 6 VOCs, and 9 inorganic compounds that are believed to be attributable to the landfill and are at or above regulatory groundwater standards (see contaminants of concern, above). The VOCs are vinyl chloride, methylene chloride, 1,1-dichloroethene, 1,2-dichloropropane, trichloroethene, benzene, and tetrachloroethene. The inorganics are antimony, arsenic, chromium, iron, lead, manganese, mercury, nickel and boron.

- Surface water and surface water sediments samples were collected during three RI sampling rounds from four locations along the intermittent stream and from fifteen locations along the Kishwaukee River. There are no detected differences between surface water samples collected from the Kishwaukee River upstream, closest to, or downstream of the landfill.

Section 2: Exposure Assessment

The organic and inorganic contaminants identified at the landfill during the RI have several potential pathways by which people may be exposed, if no further remedial action would occur. The most pertinent pathways include direct contact, volatilization and wind dispersal, landfill gas, erosion and runoff, surface water, and groundwater.

- There is a potential for exposure to the contaminants onsite via direct contact with the landfill surface soil, landfill leachate via seeps and sediment, and surface impoundment liquid and sediment. There is also a potential for exposure to contaminants via direct contact with liquid and soil associated with the two intermittent drainage channels in the field located north of the landfill and the intermittent stream sediment and water. As noted in the baseline risk assessment, direct or dermal contact with the soil and water is not expected to be significant and was not evaluated at the site.

- There is a potential for exposure to the contaminants in landfill gas, soils, and sediments via the volatilization and wind pathway to individuals onsite and downwind.

- There is a potential for exposure to the contaminants via the landfill gas pathway to onsite workers who conduct subsurface activities and to offsite areas.

- Erosion and runoff comprise an intermediate transport pathway for contaminants to migrate from the landfill to the two intermittent drainage channels in the field located to the north of the landfill, to the former landfill borrow area south of the landfill, to the intermittent stream east of the landfill; and finally, to the Kishwaukee River.

- There is a potential for exposure to the contaminants via the surface water pathway. Since the Kishwaukee River is not used as a potable water source, the primary receptors for the surface water pathway are aquatic and terrestrial wildlife that come into contact with the waterway. The RI determined that the surface water pathway does not currently serve as an exposure pathway for landfill derived contaminants being transported to surface water receptors.

- The RI had identified two primary groundwater pathways. These groundwater pathways are referred to as the West Glacial Drift Pathway and the North Interface Pathway. Both of these groundwater pathways have no direct receptors since there are no current users of the impacted groundwater downgradient from the landfill and there is no realistic future potential for groundwater use due to institutional controls. Institutional controls such as zoning and health code regulations do not allow for building houses in the flood plain nor the placement of drinking water wells. The groundwater pathways do comprise an intermediate transport pathway for contaminants to migrate from the landfill to surface water pathways and to future residential indoor air pathways. An examination of the impact of VOCs migrating along the Western Glacial Drift pathway and then offgassing to future residential basement air was evaluated as part of the baseline risk assessment using conservative contaminant migration and attenuation assumptions. The baseline risk assessment estimated that there may be low part per billion concentrations of VOCs offgassing from the Western Glacial Drift groundwater.

The potential exposure to landfill gases has been addressed to an extent by the installation and start up of the landfill gas interceptor trench and gas extractions system.

Current and Potential Site Risks:

The baseline risk assessment characterizes contaminants and potential exposures in the absence of remediation in order to determine which risks need to be reduced or eliminated. Three human health exposure scenarios were evaluated: (1) child trespasser; (2) a current residential scenario, and (3) future residential scenario. Based on the exposure pathways evaluated in the baseline risk assessment, a significant risk to human health does exist at the site associated with following pathways: (1) acute exposures to the leachate surface impoundment; and (2) future chronic exposure to residents with homes near the borrow pit. These risks will be eliminated or severely minimized with the implementation of the remedial alternatives.

A critical exposure pathway for the trespasser is acute ingestion exposure of liquid and sediment

during an accidental fall into the surface impoundment. Iron is the chemical of concern for the risk to trespassers. The incidental ingestion of iron from leachate seep water, also drives the risk to trespassers.

The baseline risk assessment determined that indoor air exposures by inhalation of landfill gas and groundwater volatiles pose a significant risk via chronic exposure to future residents living in the soil borrow pit area, adjacent to the western edge of the landfill site. The contaminants of concern that drive the noncarcinogenic risk include chlorobenzene and toluene. Benzene and vinyl chloride drive the carcinogenic risk.

A number of quantitative assumptions were made in the risk assessment, which resulted in uncertainty associated with the presumed exposure conditions. Among these is the use of maximum detected concentrations for some chemicals and some media for which data sets were limited.

Methane gas concentrations, as determined during the RI, may present a risk to public safety should housing development occur within the soil borrow pit. Levels of methane were detected in the pit area in excess of the lower explosive limit for methane.

The analysis of risk associated with the landfill site included using the data collected during the RI, computer modeling, and scientific literature reviews. Certain assumptions underlying any human health risk assessment introduce some uncertainty into the results and conclusions. This uncertainty is generally due to numerous variables associated with individuals. To compensate for uncertainty, conservative assumptions are often made which tend to overestimate rather than underestimate risk. Overall, the conservative assumptions in this baseline risk assessment are thought to result in a risk estimate that exceeds the actual site-specific risk. In other words, due to the conservative assumption, the actual risk from the site may be less than estimated. The contamination or chemicals of concern associated with the landfill site, although possessing a risk to human health and the environment, can be adequately remediated.

Groundwater was not identified in the Baseline Risk Assessment as a primary media of concern for human health or ecological pathways. The groundwater between the landfill and the Kishwaukee River is not presently, and is not likely in the future (due to institutional controls and property access restrictions), to be used as a potable water supply. As documented by data collected during the RI, the groundwater downgradient of the landfill Site discharges to the Kishwaukee River. However, the RI groundwater sampling determined that contaminated groundwater from the landfill is not currently impacting the river. The potential does exist, however, for contaminated groundwater impacting the surface water quality of the river. It should be noted that the Kishwaukee River is not a source of potable water supplies. Therefore, the potential human health concern is related only to the consumption of aquatic species (i.e., fish) from the river. Given the above, the protection of the surface water quality and the ecology of the Kishwaukee River is the primary concern with respect to groundwater remediation. Therefore, groundwater action levels have been established to be protective of surface water

quality.

Section 3: Toxicity Assessment

The purpose of the toxicity assessment is to review toxicity and carcinogenicity data for the Chemicals of Potential Concern ("COPCs"), and to provide an estimate of the relationship between the extent of exposure to these contaminants and the likelihood and/or severity of adverse effects. The toxicity assessment is accomplished in two steps: hazard identification and dose-response assessment.

The hazard identification is a qualitative description of the potential toxic effects of the COPC.

Carcinogens

The U.S. EPA has developed a qualitative weight-of-evidence classification system to define a chemical's potential to cause carcinogenic effects. This classification is based on carcinogenicity results from long-term animal tests, epidemiological studies, and other supportive data. The U.S. EPA separates chemicals into five distinct categories, ranging from Group A, chemicals for which there is sufficient evidence to consider the chemical carcinogenic to humans, to Group E, chemicals for which there is evidence of noncarcinogenicity in humans. Chemicals which have been classified in Group A through Group C were included in the quantitative risk assessment. Slope factors and unit risk values are calculated by the U.S. EPA's Carcinogen Assessment Group (CAG) and verified by the Carcinogen Risk Assessment Verification Endeavor Workgroup (CRAVE). The slope factor is 95% upper bound estimate of the slope of the dose/response curve for a particular study or group of studies involving the exposure of humans or animals. These slope factors are used to estimate the risks associated with oral exposure to potential carcinogens. Unit risks, or the risk associated with lifetime exposure to 1 ug/m^3 of a chemical in air, were used to evaluate inhalation exposures.

Noncarcinogens

The determination of the health hazards associated with exposure to noncarcinogens is made by comparing the estimated chronic intake of a compound with the reference dose (RfD) for oral exposures or the reference concentration (RfC) for inhalation exposures. For the MIG/DeWane risk assessment, chronic RfDs and RfCs were used for the determination.

A chronic RfD is defined as an estimate of a daily exposure level, or in the case of RfCs, a daily exposure concentration, for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of harmful effects during a lifetime exposure. The RfDs and RfCs are specifically developed to be protective of long term exposure to a compound. A RfD or RfC is typically derived by applying a safety factor on of one or more orders of magnitude to a dose thought to represent a no observed adverse effect level (NOAEL) in humans. The magnitude of the uncertainty factors that are applied when developing and RfD or RfC is

dependent on the quality and applicability of the available animal and human toxicity studies.

Subchronic RfDs and RfCs have been developed for some chemicals to assess exposures between two weeks and seven years. Acute RfDs and RfCs are developed on a case by case basis for even shorter exposure durations, such as those associated with an accidental fall into the leachate surface impoundment.

An acute RFD was developed from the one-day health advisories published by the U.S. EPA (EPA, 1992). For the chemicals of concern detected in the surface impoundment, one-day health advisories were available for antimony and beryllium. A minimum risk level ("MRL") was developed by the Agency of Toxic Substances and Disease Registry ("ASDDR"). This MRL is based on a NOAEL of 5mg/kg (day and a Lowest Observed Adverse Effects Level ("LOAEL") of 50 mg/kg/day associated with neurological effects in rabbits (ATSDR, 1991). These values were used in the assessment of surface impoundment exposures. An acute RFD was not available for iron. The chronic RFD used in the risk assessment is a provisional value developed by the U.S. EPA Superfund Health Risk Technical Support Center.

Section 4: Risk Characterization

Potential cancer risks are assessed by multiplying the estimated lifetime average daily intake (LADI) of a carcinogen by its slope factor ("SF"). This calculated risk is expressed as the probability of an individual developing cancer over a lifetime and is an estimated upper-bound incremental probability. Cancer risks initially are estimated separately for exposure to each chemical for each exposure pathway and receptor category (i.e., adult or child). Separate cancer risk estimates then are summed across chemicals, receptors, and all exposure pathways applicable to the same population to obtain the total excess lifetime cancer risk for that population. Cancer risk estimates are provided in scientific notation; 1×10^{-6} is equivalent to 1E-6, which equals 0.000001.

The potential for adverse effects resulting from exposure to a noncarcinogen is assessed by comparing the estimated chronic daily intake ("CDI") or Subchronic Daily Intake ("SDI") of a substance to its chronic or subchronic RfD. This comparison is made by calculating the ratio of the estimated CDI or SDI to the corresponding RfD to yield a hazard quotient ("HQ"). HQs that are associated with similar critical effects (e.g., liver damage) should be summed together to obtain a hazard index ("HI") for that effect, whereas HQs for different critical effects should be kept separate. However, for screening purposes, HQs are commonly summed across all chemicals, exposure routes, and pathways applicable to a given population to obtain an HI for that population.

For evaluating noncarcinogenic effects, U.S. EPA defines acceptable exposure levels as those to which the human population, including sensitive subgroups, may be exposed without adverse effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety (EPA 1989). This acceptable exposure level is approximated by a HI less than or equal to 1.0.

Non-cancer risks are usually assessed by calculating a hazard quotient, which is the ratio of the estimated exposure to the RfD as follows:

where:

HQ = Hazard quotient;
CDI = Chronic daily intake (exposure); and
RfD = Reference dose (acceptable daily intake).

These risks are summarized in the following table

Summary of Carcinogenic and Noncarcinogenic Risks

MIG/DeWane Landfill
Belvidere, Illinois

RECEPTOR	MEDIA-SPECIFIC HAZARD INDEX (unitless)	DISTRIBUTION OF NONCARCINOGENIC RISK BY MEDIA (%)	MEDIA SPECFIC CANCER RISK (unitless)	DISTRIBUTION OF CARCINOGENIC RISK BY MEDIA (%)
TRESPASSER				
Soil/Sediment				
Onsite Soil	1.2E-05	0%	5.1E-08	1%
Offsite Soil	4.6E-03	0%	2.7E-08	1%
Drainage Channel Soil	2.6E-05	0%	3.0E-09	0%
Intermittent Stream Sediment	0	0%	1.2E-08	0%
Leachate Seep Sediment	5.9E-03	0%	0	0%
Surface Water				
Intermittent Stream Water	1.8E-01	2%	2.2E-06	64%
Leachate Seep Water	7.8E-01	10%	1.1E-06	31%
Acute Exposure				
Surface Water Impoundment Water	1.0E+00	13%	9.7E-10	0%
Surface Water Impoundment	5.8E+00	75%	2.5E-09	0%

Air				
Onsite Ambient Air	6.7E-04	0%	5.3E-08	2%
Offsite Ambient Air	5.5E-04	0%	4.7E-08	1%
Totals=	**7.8+00**	100%	**3.5E-06**	100%
CURRENT RESIDENT				
Air				
Ambient Air	1.1E-03	100%	2.8E-07	100%
Totals=	**1.1E-03**	100%	**2.8E-07**	100%
FUTURE RESIDENT				
Air				
Indoor Air from landfill gas/groundwater	4.1E+00	100%	1.1E-03	100%
Ambient Air	1.5E-03	0%	3.6E-07	0%
Totals=	**4.1E+00**	100%	**1.1E-03**	100%

Source: Illinois EPA's Baseline Risk Assessment (CDM, 1997)

Ecological Assessment

The Ecological Risk Assessment ("ERA") evaluates the likelihood that adverse ecological effects may occur or are occurring at a site as a result of exposure to single or multiple chemical or physical stressors. Risks result from contact between ecological receptors (i.e., plants, animals, fish) and stressors (i.e., chemicals) that are of sufficiently long duration and of sufficient intensity to elicit adverse effects. The primary purpose of the ERA is to identify and describe actual or potential onsite conditions that can result in adverse effects to present or future ecological receptors.

The ERA focused on primary ecological stressors and exposure pathways identified as being associated with the site. The primary stressors were identified as having potential to cause ecological stress include many inorganic and organic chemicals in (1) onsite surface water, (2) leachate surface impoundment and intermittent stream sediments, and (3) leachate seep, drainage channel, and onsite and offsite surface soils. Preliminarily identified potential chemical stressors

include a wide variety of chemicals including inorganics (metals), volatile organic compounds, and semi-volatile organic compounds, such as polychlorinated biphenyls ("PCBs"), polycyclic aromatic hydrocarbons ("PAHs"), and pesticides.

The final baseline ERA identified risks to representative ecological receptors from exposure to selected chemicals of concern as follows.

- Aquatic biota such as aquatic plants (algae), zooplankton (daphnids), sensitive bethic invertebrates, and sensitive fish species are likely to be adversely impacted by: (1) copper and cyanide, and to a lesser degree, 4-methylphenol cobalt, lead, nickel, vanadium, and zinc in surface water of the intermittent stream; and (2) cadmium and cyanide, and to a lesser degree, bis(2-ethylhexyl)phthalate, pyrene, nickel and zinc in sediment of the intermittent stream and possibly Kishwaukee River sediments. These effects are likely to include mortality, reproductive effects, and growth effects for sensitive species.

- Terrestrial plants may be at risk from: (1) direct contact with drainage channel surface soil due to elevated (phytotoxic) concentrations of cadmium, lead, vanadium, and to a lesser extent, nickel and zinc; (2) direct contact with leachate surface soils due to elevated (phytotoxic) concentrations of vanadium and zinc, and to a lesser extent, cadmium, lead and nickel; and (3) direct contact with onsite and offsite surface soils due to elevated (phytotoxic) concentrations of vanadiumand zinc, and to a lesser extent, cadmium, lead, and nickel. These effects are likely to include reduced growth, germination, or reproductive success.

- Terrestrial soil-dwelling animals (e.g., soil invertebrates, reptiles, small burrowing mammals, songbirds, and carnivorous birds and mammals) are expected to be at low risk from exposure to surface soil in the drainage channels, leachate areas, offsite and onsite. Risks are location-dependent and influenced by variables such as diet, season, foraging area, and mobility of consumers, and by the level of contamination in surface soil and food items. Ecologically significant exposure through ingestion of contaminated food items is considered to be unlikely because the primary COCs in surface soil do not bioaccumulate to a great degree.

Summary of Chemical Properties for Final Chemicals of Concern (COCs)

Chemical or Class of Chemical	Bioaccumulation Potential	Bioavailabilitly and Toxicity	Environmenta Persistence
Polychlorinated Biphenyls (PCBs)	Variable, but most highly chlorinated PCBs (e.g., Aroclor 1254, 1260) accumulate to a very high degree in biological tissues. Primarily stored in fatty tissues of animals. Terrestrial plants take up less chlorinated PCBs more rapidly than highly chlorinated PCBs (Eisler, 1986)	For aquatic biota, low solubility decreases bioavailability and toxicity of highly chlorinated PCBs.	Persistence increases with chlorination. Highly chlorinated PCBs very resistant to bacterial degradation and are very persistent in the environment
Polycyclic Aromatic Hydrocarbons (PAHs)	Variable, but most animals and microorganisms can metabolize PAHs to products that ultimately experience complete degradation (Eisler 1987). Rapid uptake and rapid metabolism/elimination is expected in most cases.	Toxicity increases with molecular weight (MW) in most cases. Low solubility decreases bioavailability of high MW PAHs. Bioavailability in sediments is generally low. Some PAHs are carcinogenic to mammals.	Generally persistent. Primarily degraded by photolysis and microbial degradation. Degradation slow in sediments that are anoxic with little light penetration.
Pesticides/Herbicides	Variable but many, especially chlorinated hydrocarbons (e.g., aldrin, dieldrin) accumulate to a very high degree in biological tissues. Organochlorine compounds (e.g., chlordane) are readily taken up but more easily metabolized. Most are stored in fatty tissues of animals.	Most highly toxic an readily bioavailable to aquatic and terrestrial biota.	Most chlorinated hydrocarbons are persistent in the environment because they are resistant to degradation. Organochlorines such as chlordane are generally short-lived in water but may persist in soils.
Volatile Organic Compounds	Low bioaccumulation potential.	Generally low toxicity. Several are common laboratory contaminants. Detections in surface medial should be viewed with caution due to expected volatilization and rapid degradation.	Not persistent. Easily degraded.
Inorganics	Highly variable. Mercury only metal that is expected to bioaccumulate to a high degree. Others, such as copper and zinc, can accumulate to a moderate degree in aquatic biota. Terrestrial biota less likely to accumulate most metals. No reported bioaccumulation for cyanide.	Variable toxicity. Mercury and cadmium highly toxic. Copper, silver, zinc and several others moderately to highly toxic, depending on receptor. Bioavailability in aquatic systems decreased with increasing water hardness and dissolved organic carbon. Acid volatile sulfides mitigate toxicity in sediments for some metals. Cyanide highly acutely toxic—rapid degradation minimized chronic toxicity potential.	Metals highly persistent, not degraded. Cyanide not persistent in surface water but may persist in groundwater (Eisler 1991).

Basis for Action

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of pollutants or contaminants or hazardous substances from this Site into the environment and which may present an imminent and substantial endangerment to public health or welfare and/or the environment.

VIII. Remedial Action Objectives

To address the problems identified in the RI and the remedial response actions needed for each Superfund site, the remedial action objectives must be identified first. The remedial response objectives for the MIG/DeWane Landfill Site are based on the exposure levels and risks associated with contamination from the landfill and the leachate surface impoundment. The remedial response objectives consider:

- Site Characteristics that delineate the fate and transport of contaminants and pathways of exposure;
- Human and environmental receptors; and
- The associated short-term and long-term human health and environmental effects.

To meet these broad goals, more focused remedial actions objectives must be identified and then the various possible remedial actions to meet these objectives must be evaluated, as occurred in the FS.

The remedial action objectives identify the problems associated with the site such as: site-specific chemicals of concern, media of concern, potential exposure pathways, and remediation goals. The remedial action objectives are based on the RI and baseline risk assessment results, as well as the appropriate state and federal environmental regulations. The remedial action objectives will be achieved through specific remedial response actions. Further details on the remedial action objectives are included in the FS document.

The following remedial action objectives, based on the findings of the RI, have been identified for the MIG/DeWane Landfill Site:

- Mitigate potential human and ecological risks associated with leachate seeps, including leachate waters, sediments, and corresponding offsite precipitation
- Mitigate potential human exposure risks associated with the surface impoundment liquids and sediments.

- Minimize the impacts of precipitation runoff on the surface water and sediment quality of the drainage channels and intermittent stream.
- Minimize leachate migration potential to groundwater.
- Mitigate potential human risk associated with the offsite migration of landfill gas towards residential homes west of the landfill.
- Restrict future development on the landfill, as well as in the soil borrow pit west of the landfill.
- Groundwater will be returned to drinking water quality through landfill containment/control measures and natural attenuation, and will comply with water quality criteria for Class I aquifers established under Illinois 35 IAC Part 620 (Groundwater Standards).
- Address potential future impacts to surface water from migration of contaminated groundwater.
- Address potential ecological risks associated with leachate seeps runoff to the intermittent stream, drainage channels to the north, and the Kishwaukee River.

The remedial action objectives, as indicated immediately above, will result in response actions that provide for waste containment, leachate generation reduction, reduction and control of landfill gas, and the minimization of contaminant migration to groundwater and surface waters through landfill capping. The necessary response actions were considered through the development of various remedial alternatives. The response actions and aspects of the remedial alternatives are included below.

<u>Landfill Source Waste Containment</u>

The landfill capping/containment remedial response action will address the remedial action objectives associated with both prevention of direct contact with refuse and control of leachate. In addition, any leachate contaminated surface soils, as well as contaminated surface impoundment sediments will be placed under the cap. Capping reduces the migration of leachate constituent from the buried waste to groundwater, surface water, and air resulting from leachate surface seeps or downward percolation. It is an effective containment technology that prevents direct human contact and reduces surface infiltration and the volume of corresponding leachate generation. Leachate seep sediment will be covered/capped as part of the final remedy. Surface water runoff controls to enhance capping integrity and minimize potential refuse and seep contact with precipitation will also be implement as part of the landfill capping.

The Illinois EPA is recommending a multi-component cap system composed of a vegetative layer, a soil protective layer, drainage layer, and a geosynthetic clay cover with a geomembrane be installed over the entire landfill landfill. The engineering specifications for the selected material will be based on U.S. EPA guidance.

Leachate Removal

The leachate seeps that were historically observed coming from the landfill have been significantly reduce by the placement of the interim cap during the Interim Response Measures activities in the early 1990s. However the interim cap was only a partial cap that does not meet the requirements of Part 811 of 35 Illinois Administrative Code for landfill cover systems. Observed leachate seep conditions are believed to be a result of the localized accumulation of leachate in combination with an inadequate depth of soil cover. It is believed that the installation of an adequate cap system over the landfill would prevent the future accumulation of leachate (i.e., the permeability of the landfill base would be greater than the cap), which would result in the gradual dissipation of the current leachate accumulation and mitigate long-term seep problems.

The planned active leachate removal scenario includes continued operation of the existing system located within the eastern portion of the landfill, in combination with the construction of a complementary drainage system within the major seep areas along the western portion of the landfill. The existing leachate removal system would continue to be operated as is within the eastern portion of the Landfill. A leachate holding tank system would have to be installed as a replacement for the closure of the surface impoundment.

Landfill Gas Generation and Migration

The remedial action objectives will also result in remedial response actions that will reduce and intercept gas mitigation from the landfill. According to the baseline risk assessment, landfill gas migration poses an exposure concern for the future residents scenario if residential homes are constructed in the IRM soil borrow pit area west of the landfill, and possibly pose a risk of chronic exposure to homes built near the borrow pit. Horizontal landfill gas migration away from the landfill is also believed to have contributed to the low-level groundwater impacts to the west, northwest of the landfill. The gas extraction remedial alternatives include passive and active venting systems.

Offsite landfill gas migration to the west was identified as a migration pathway of concern in the baseline risk assessment in the event future residential development occurs within the IRM borrow pit area to the west (not feasible given the current deed restriction). Since residential homes located further west of the IRM borrow pit area may still represent a potential exposure pathway of concern, a landfill perimeter gas monitoring system (proximate to and/or outside of the landfill perimeter fence) was installed along the western boundary of the refuse burial. The

monitoring system was installed in order to provide additional data to evaluate the extent of offsite gas migration. Presently, the monitoring system is being used to assess the effectiveness of the collection system in the active mode at controlling landfill gas migration to the west. It will continue to provide effectiveness information during the Remedial Action ("RA") phase.

Passive gas venting systems are specifically designed to collect and direct the subsurface movement of landfill gases using vertical pipe vents or trenches. Passive venting systems can be installed either within the interior or around the perimeter of a landfill. Individual pipe vents are limited in their area of influence, but can be an effective and inexpensive means of reducing localized landfill gas pressures within and around the perimeter of a landfill when installed as a system of multiple vents. Trench collection vents are typically more effective in controlling the lateral movement of landfill gas if keyed into low permeability materials or extended to the water table. Both vertical wells and a trench, or a combination, can be applied for venting in the vicinity of the landfill site. Passive gas vents to be installed within the landfill can be upgraded to active gas extraction.

The baseline risk assessment defines the potential future residential exposure scenario associated with landfill gas migration to the west. Landfill gas sampling near and in the subdivision during early 1999 determined that methane gas posed a possible hazard of flammability in some homes. To address this problem, an active gas collection trench was installed along the western boundary of the landfill. The trench was constructed down to near the water table and intersected the permeable vadose zone sand seams that have been identified as extending to the west of the landfill site. The permeable vadose zone sand seams represent the expected pathway of landfill gas migration (i.e., conceptual model for the Site). As previously mentioned, the function of the active gas collection trench is to intercept the pathway of offsite landfill gas migration to the west towards the residential homes.

In addition to the gas collection/interceptor trench, six vertical gas extraction were installed near the eastern boundary of the subdivision and the western boundary of the borrow pit. These gas extraction wells are being used to remove landfill gas from underneath the subdivision.

The two mechanisms for offsite migration include convection and diffusion. Gas flow due to convection (i.e:. based on subsurface pressure gradients) represents the primary mechanism for offsite gas migration. Diffusion migration, which results from the movement of gases from areas of higher to lower concentrations (i.e., based on subsurface concentration gradients) is limited in the distance that it will propagate. Horizontal gas migration due to diffusion is typically limited to less than 100 feet.

Groundwater Remediation via Monitored Natural Attenuation

Groundwater has not been identified in either the RI or the baseline risk assessment as a media of concern from a human or ecological exposure perspective for purposes of screening general response actions and corresponding remedial technologies. Low levels of various leachate

constituents were measured in groundwater downgradient of the landfill. A small number of VOCs (primarily vinyl chloride and benzene), inorganic compounds (primarily iron and manganese), and total chlorides are in marginal exceedence of their respective Illinois Class I groundwater quality criteria. Although groundwater was not identified as a media of concern, this ROD requires a reassessment of the risk of VOCs in groundwater and the possible volitalization of VOCs into residential basements.

It should also be noted that alternative groundwater pump and treat or containment approaches, the other general response actions that can be considered for offsite groundwater, would not be any more effective as monitored natural attenuation for the site. It is well documented that pump and treat approaches are not effective at meeting groundwater ARARs or achieving full aquifer restoration that involve meeting cleanup criteria in the low ppb range. In addition, there is ultimately a mass transfer barrier (e.g., desorption) that limits the final groundwater concentrations that can be achieved either by natural aquifer flushing or pump and treat.

U.S. EPA guidance document titled *Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites* (1996) identifies monitored natural attenuation as a viable remedy for groundwater, if sufficient information exists that natural processes can achieve the remediation objectives with the implementation of adequate source control measures, monitoring and institutional controls. A more recent U.S. EPA document *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (1997) identifies monitored natural attenuation as a viable approach for lower concentration groundwater impact conditions, and in instances where the remediation time frame to achieve groundwater ARARs would be comparable to existing pump and treat or in-situ treatment technologies.

The groundwater contaminant plume will be addressed using a monitored natural attenuation approach. Source control (i.e., landfill capping) and performance monitoring are fundamental components of any monitored natural attenuation remedy. A network of groundwater monitoring wells will be sampled on a regular schedule to determine the effectiveness of natural attenuation.

The term "monitored natural attenuation" refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site specific remedial objectives within a time frame that is reasonable compared to that offered by other more active methods. The "natural attenuation processes" that are at work in such a remediation approach include physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. Natural attenuation processes may reduce the potential risk posed by site contaminants in three ways:

1. The contaminant may be converted to a less toxic form through destructive processes such as biodegradation or abiotic transformations;

2. Potential exposure levels may be reduced by lowering of concentration levels (through the destructive processes, or by dilution or dispersion); and

3. Contaminant mobility and bioavailability may be reduced by sorption to the soil or rock matrix.

Natural attenuation is being provided in a complementary manner at the site by the combination of the interior landfill environment and the lower permeability glacial till zone present beneath the refuse burial, as well as the higher permeability of the Interface Hydrostratigraphic Unit. This is evidenced by the much lower concentrations of VOCs and chlorides measured in groundwater at the site, versus what was measured in the leachate well samples and what can be considered typical for uncontrolled municipal landfills. Primary natural attenuation mechanisms include the following: adsorption to natural organic carbon content in the unsaturated zone glacial till soils; biodegradation in the vapor and adsorbed soil phases in the unsaturated zone and dissolved aqueous phase in the saturated zone; dispersion of the dissolved phase in the saturated zone; and immobilization/precipitation of metals present in the dissolved phase in the saturated zone resulting from changes in subsurface oxidation/reduction valence states as constituents migrate away from the presence and influence of landfill leachate. Given the existence of monitoring well data from the landfill interior to the Kishwaukee River, the ultimate groundwater receptor, the RI data demonstrate the magnitude of the natural attenuation process.

The RI data support the following conceptual model for the site and what is commonly known about landfill fate and transport mechanisms:

- The fine-grained, low permeability materials underlying the landfill are believed to be impeding the migration of leachate constituents of the Interface and Galena-Platteville Hydrostratigraphic Units. A large portion of the refuse burial occurred above grade and, therefore, neither the refuse nor corresponding leachate is in direct contact with groundwater. Approximately 10 to 25 feet of lower permeability till exist between the base of the landfill and the Interface Hydrostratigraphic Unit. The hydraulic conductivity of the till unit, based on laboratory testing of soil samples collected from natural till soils analogous to what is present at the base of the landfill, is on the order of 10^{-6} to 10^{-7} cm/sec.

- The leachate versus monitoring well data demonstrate that downward leachate migration through the till base soils of the landfill is being impeded and natural attenuation is occurring. Natural attenuation mechanisms (e.g., retardation, adsorption, biological degradation) known to be associated with landfill environments (i.e., interior boundaries of refuse burial) and the low permeability till soils beneath the refuse burial are responsible for minimizing the groundwater impacts immediately downgradient of the landfill.

- The downgradient monitoring well data (total chlorides, in particular, which are not subject to any degradation mechanisms) demonstrate the complementary natural attenuation capacity of the shallow groundwater zones as migration of groundwater leachate constituents occurs

away from the landfill and towards the Kishwaukee River. The primary natural attenuation mechanisms associated with the shallow groundwater zones appear to be dilution, dispersion, and metals precipitation into the native soil matrix.

- The low-level constituents in groundwater have not adversely impacted the water or sediment quality of the Kishwaukee River.

- The following RI findings and conclusions support the conclusion that the site conditions are providing a significant level of natural attenuation capacity and are capable of limiting leachate constituent migration even, possibly, in the absence of additional landfill control measures:

- The reduction in total chloride concentration between the leachate and groundwater demonstrates the natural attenuation mechanism provided by the dilution and dispersion mechanisms of groundwater flow. Average total chloride concentrations decreased from approximately 4,000 mg/L in the leachate to between 160 and 640 mg/L in groundwater around the perimeter of the landfill and 25 to 200 mg/L in downgradient groundwater.

- The primary leachate constituents (e.g., various ketones, aromatic hydrocarbons, and phenols) are virtually absent in the offsite groundwater samples. Most of these compound are considered relatively soluble and mobile in groundwater and, thus, are not typically as prone to subsurface retardation/attenuation mechanisms. The virtual absence of these compounds in offsite monitoring well samples mean downward leachate migration is being impeded, and/or these compounds are being naturally biodegraded or dispersed within the unsaturated or saturated zones beneath the landfill prior to migrating offsite. Biodegradation of ketones and phenols, principal leachate constituents, is a natural attenuation mechanism within the landfill interior and the base till soils beneath the refuse burial, based on their known susceptibility to aerobic biological degradation (and possibly anaerobic biological degradation).

- Mobile organic leachate constituents concentrations in groundwater are low in comparison to corresponding concentrations measured in leachate samples, an indicator that natural attenuation is occurring for these compounds. Only the most mobile and persistent of the organic leachate constituents (e.g., vinyl chloride and benzene) were found at low ppb concentrations in groundwater. At a minimum, the natural attenuation of these compounds in occurring by the dilution and dispersion mechanisms. A level of retardation also likely occurs within the till base soils beneath the refuse burial. The presence of VOCs constituents in groundwater could also be a result of horizontal landfill gas migration, as opposed to vertical leachate percolation, or a combination of both.

- Natural precipitation of metals present in the leachate (e.g., iron and manganese) back into the native soil matrix, due to a shift from an anaerobic environment inside of the landfill to an oxidized state away from the influence of the refuse burial, is a natural attenuation

mechanism between the landfill interior and perimeter groundwater monitoring wells. Inorganic metals appear to be returning to near natural background levels prior to reaching the Kishwaukee River.

- The low concentrations of daughter products cis-1,2-dichlorothene and vinyl chloride in offsite monitoring wells, versus the relative absence of the parent compounds trichloroethene and tetrachloroethene, suggests these leachate constituents compounds are being biodegraded via a reductive dehalogenation mechanism within the landfill interior, probably within the base soils beneath the refuse burial, and possibly within the Glacial Drift and Interface Hlydrostratigraphic units.

The time frame required for monitored natural attenuation to reach Illinois Class I groundwater quality criteria or the cleanup objective for the groundwater migrating to the west-northwest of the landfill through the West Glacial Pathway is estimated to range from 13 to 26 years. This time frame is the same if various additional contingent leachate removal scenarios are implemented. The time frame required for natural attenuation to reach Class I groundwater criteria or the cleanup objectives for the groundwater migrating north of the landfill through the North Interface Pathway under the planned leachate removal scenario and natural attenuation is from 81 to 108 years. When this approach is combined with the contingent leachate removal scenario, the time frame is estimated to range from 54 to 81 years. The difference between the two leachate removal/natural attenuation remediation scenarios meets the criteria of U.S. EPA guidance document on monitored natural attenuation.

As stated earlier in this document, institutional controls are already in place to restrict the use of offsite groundwater by current residential homes to the west of the Landfill. Consequently, water supply wells have not been, and will not be, installed within the residential area to the west, thus removing offsite groundwater as a current human exposure pathway. Per the Boone County Health Department, a permit to install a water-well will not be issued if municipal water is provided by the city.

The groundwater at the site and groundwater in the areas immediately adjacent to the site are not used as a drinking water source. Private drinking wells do exist north of the Kishwaukee River, but groundwater flow north of the river is south towards the river.

The human health risks are effectively addressed by the remediation goals, some of which are now presently being addressed through the landfill gas extraction and interception system. The capping of the landfill will effectively reduce groundwater infiltration through the landfill waste, thus reducing the generation of landfill leachate and gas. The landfill gas is presently being remediated as mentioned above. The landfill cap and a leachate collection system will result in dramatically reduced contamination to groundwater by contaminants such as VOCs. Contaminants presently in the groundwater and soil are apparently undergoing natural attenuation or intrinsic remediation due to the composition and chemistry of the soil.

IX. Description-of Alternatives

The general response actions that were developed for the MIG/DeWane Site were developed to address the various media of concern and the remedial action objectives. The details of how the response actions were developed are included in the FS document. Both the media of concern and the remedial action objectives that were developed and included in the FS are based on the results of the RI and the baseline risk assessment. For all remedial alternatives, the state and federal regulations and ARARs will be complied with and the appropriate U.S. EPA guidance will be followed.

The site area and media (i.e., soil, groundwater) to be addressed by the remedial actions at the MIG/DeWane Landfill include the following:

1. The landfill, which is approximately 47 acres in size, measuring approximately 50 to 55 feet in height, containing an estimated 3,715,200 cubic yards of waste, with an indeterminate volume of leachate and landfill generated gas; and
2. The leachate surface impoundment, which measures approximately 130 feet wide by 130 feet long by 10 feet deep.

The media to be addressed include leachate, landfill gas (methane), groundwater, and leachate soil sediments. In addition, VOCs that may volatilize from the groundwater must be remediated from under the western soil borrow pit. The soil borrow pit is approximately 19 acres in size. The landfill cap, leachate removal, and gas extractions system should reduce the VOC migration to groundwater.

The general response action categories to be addressed are included below and are addressed by the various possible remedial alternatives. It is remedial alternative 4A that is believed to provide for the best over all set of response actions for the following:

- Groundwater
- Buried Refuse/Surface Soils
- Landfill Gas
- Leachate

Capping Alternatives

The capping remedy

There are five (5) main capping remedial alternatives that are included in the FS document. In addition, two of the five main alternatives have sub-alternatives. The Illinois EPA has proposed a 6th capping alternative, designated as Alternative 4A. Alternative 4A is different from Alternative 4 in that it requires that more soil be used in the landfill cap, but not as much soil as proposed by Alternative 5.

Alternative 4 does not meet the Illinois EPA Applicable or Relevant and Appropriate Requirements ("ARARs") for and adequate depth of cover soil. Alternative 5 does meet ARARs but construction/engineering problems apparently do not make this alternative possible. Alternative 4A is a comprise design between the alternatives.

Except for Alternative 1, the remedial alternatives all include additional landfill capping requirements. The landfill cap alternatives are different from each other. Alternative 1, the No Action Alternative, is a baseline for comparison to other alternatives. SARA mandates the inclusion of the No Action alternative.

The following capping options have been developed and are presented by their respective remedial alternative designations:

- Alternative 1 - Alternative 1 represents no additional action, beyond the previous interim remedial measures of 1992/3. The no additional action alternative will be used as a basis for evaluating remedial alternatives against the results of the Baseline Risk Assessment.

- Alternatives 2A and 2B - Alternative 2A would leave the interim remedial measures cap in place and construct an analogous 2-foot compacted clay cap over the side slopes of the landfill. An optional drainage layer could also be installed. Alternative 2B includes all of 2A, plus the addition of a 3-foot protective soil layer over the compacted clay layer.

- Alternative 3A and 3B - Alternative 3A involves the installation of a geosynthetic clay cap (GCL) over the landfill crest to further reduce precipitation infiltration and protect the older interim response measures cap, and 2 feet of compacted soil on the landfill side slopes, with an optional drainage layer. Alternative 3B includes all of 3A, plus the addition of a 3-foot protective soil layer over the GCL.

- Alternative 4 - Alternative 4 involves the installation of a grading layer of no specific depth, over the landfill side slopes, a GCL cap over the entire landfill, a drainage layer over the entire landfill, and 1 ½-foot protective soil layer over the GCL and drainage layer.

- Alternative 4A - Alternative 4A is an option not included in the FS, but an option proposed by the Illinois EPA. This option includes all of Alternative 4, but requires the grading layer to be of a minimum depth of 1-1½ feet and the final protective soil layer to be 30 inches on the crest of the landfill and top of the landfill side slopes, with a minimum of 2 feet of

protective soil layer at the bottom of the side slopes.

- Alternative 5 - Alternative 5 includes all of Alternative 4, but instead of a 1 ½ -foot protective soil layer, it includes a 3-foot protective soil layer.

Common Non-Cap Components of Remedial Alternatives 2-5

The Superfund program requires that the "no-action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative the Illinois EPA and USEPA would take no further action at the site to prevent exposure to the soil and groundwater contamination. This alternative is applicable to each of the media addressed by the RI/FS.

The common, non-cap, components for Alternatives 2-5 include the following:

- Institutional controls for the Landfill and the Soil Borrow Pit area, west of the landfill. Institutional controls such as zoning restrictions, deed restrictions, and public health regulations restrict development in these areas and not allow for the installation of drinking water wells.

- Removal of all leachate surface impoundment liquids and sediments.

- Natural attenuation/intrinsic remediation of groundwater and institutional controls to meet Illinois and Federal groundwater and surface water regulations.

- Leachate collection system to minimize leachate flow to groundwater.

- Offsite leachate treatment and disposal.

- Landfill gas collection system.

- Leachate and landfill gas monitoring.

- Long-term groundwater monitoring.

- Construction of a landfill surface water diversion system.

Summary of Non-Cap Components Common to Alternatives 2-5

NOTE: Additional specific details of the Common Non-Cap Components for Remedial Alternatives were included above in the Remedial Action Objective section. Details for the the Remedial Alternatives were included above in an attempt to explain how the Remedial Action

Objectives will be met by implementing the Remedial Alternatives.

Construction and operation of a leachate collection and monitoring system: Because leachate has been migrating to and contaminating groundwater and a contaminant plume was detected moving towards the Kishwaukee River, an enhanced leachate collection system will be installed. The leachate collection system will be composed of the present gravity controlled leachate collection system and a few collection trenches located on the landfill in the area of major leachate seeps. The gravity controlled leachate collection system located in the eastern third of the landfill was installed during the original construction of the landfill. The enhanced leachate collection system will mitigate leachate surface leachate seeps, reduce hydrostatic pressure within the landfill, and reduce leachate contamination into groundwater. A localized leachate gravity collection and drainage system will use a system of either permeable bed layers, or passive trenches, and if necessary vertical wells, for the major leachate seep areas.

In general the major seep areas are located on the north and northwestern slopes of the landfill. To intersect major leachate flow areas, passive collection trenches and/or a permeable bed layer consisting of perforated pipe surrounded by highly permeable coarse stone aggregate will be installed across the face of the major leachate seep areas. Also, interior vertical leachate extraction wells used to mitigate the future occurrence of seeps, will be installed in areas where there is a need based on the internal hydrostatic pressure measurements and engineering determinations.

The vertical leachate collection wells will be operated under gravity or artesian conditions for a period of time necessary to reduce localized leachate head buildups to sufficient levels that minimize and stop the seeps. If, however, leachate must be removed in a shorter time frame than can be achieved by gravity operation to mitigate future seeps, or active interior leachate extraction must be implemented as a contingent remedial action measure to address groundwater contamination, surface water (Kishwaukee River) regulations or other ARARs, then vertical leachate extraction wells will be fitted with submersible pumps to perform active extraction for a limited duration until the remedial objectives are met. The conditions that would result in the additional enhancement of the leachate collection system are those that would result in a sustained increase in groundwater contamination, or those that indicate no decrease in groundwater contamination over a specific time interval. The collected leachate will be treated onsite or transported offsite for treatment and disposal. Also, there are additional possible contingent leachate removal options identified in the FS. These options include the following:

- A perimeter trench system can be constructed along key lengths proximate to identified areas of leachate accumulation;
- Horizontal well laterals can be installed along the base of the western portion of the refuse burial area;
- Passive gas vent wells located in identified areas of leachate accumulation can be retrofitted to operate as leachate extraction wells; and
- Any combination of the three leachate removal alternatives described above can be

implemented if the combination is more cost effective than implementing each of alternatives separately.

The additional leachate removal options would be used if either of the following scenarios occurred: (1) design analysis based on the pre-design leachate monitoring data indicates that leachate removal must be accomplished in a shorter time frame to mitigate the seep conditions; or (2) in the event that the corresponding trigger mechanism criteria described below in the Groundwater Monitoring Plan part of this section are exceeded.

The extent of passive leachate collection trenches, permeable interceptor beds, or other contingent leachate removal components as described in the FS will be established as part of the remedial design using additional data obtained during pre-design sampling investigation and study. An engineering evaluation of future seep potential and a leachate head drawdown analysis will occur. The extent of these leachate removal component of the remedial action will be sufficient to collect and convey leachate that flows to the trench, bed, or other leachate management component, mitigate seep potential, dissipate high leachate heads, and work effectively with the cap to meet the remedial action objectives.

The contingent leachate removal scenarios are provided as a contingent response measure that may be performed, based on an exceedance of trigger mechanism criteria. These contingent leachate removal scenarios, if triggered, would continue until piezometer data indicate internal hydrostatic pressures have been sufficiently relieved to either prevent future leachate seep problems or prevent continued migration of leachate constituents to groundwater, with a corresponding reduction in groundwater and soil gas contaminants being observed.

Construction and operation of an active and passive perimeter landfill gas collection, treatment and monitoring program: The landfill gas and treatment collection system will reduce interior landfill pressures which serve as a driving force for gas migration. This system will protect residential homes west of the landfill from potential uncontrolled offsite gas migration, as well as reduce landfill gas pressure within the interior of the landfill, thus protecting the integrity of the landfill cap.

The gas collection system will include a combination of passive vents in the landfill interior and include a gas collection trench along the western edge of the refuse burial boundary. If necessary the passive gas vent wells can become active vents. The western-perimeter gas collection system will initially be operated in an active mode, as is necessary. The gas extraction trench and gas extraction wells have been installed. Gas vapor probes have been installed to monitor gas migration, especially to the area west of the landfill.

Leachate surface impoundment closure: All surface impoundment liquids and a minimum of two feet of sediments will be removed, as was determined to be necessary by the RI sampling. The impoundment liquids will be treated and disposed of offsite. The contaminated sediments will be excavated and consolidated beneath the landfill cap. The surface impoundment will then

be filled with clean soil.

Surface water diversion system: A surface water diversion system will be installed along the landfill side slopes. This system will include drainage ditches around portions of the toe of the landfill, where feasible, and corresponding discharge lines/routing. Erosion control measures, and structures will be implemented where necessary.

Implementation of access restrictions and institutional controls: Institutional controls such its site security fences, zoning restrictions, deed restrictions, and adherence to local ordinances restricting groundwater use will be used to restrict access to the site and contaminated groundwater. Institutional controls including no development on the landfill site, or in the soil borrow pit west of and adjacent landfill will be implemented.

The areas to the north and northwest of the landfill will be designated as a Groundwater Management Zone ("GMZ"). A GMZ is a three dimensional region in which the groundwater must be managed to mitigate impairment caused by the release of contaminants from a site. Groundwater management to mitigate impairment can use various combinations of technology. The groundwater management measures need to be direct measures that contain and remediate groundwater. 35 IAC Code 620.250 allows for the establishment of GMZs within any class of groundwater.

The agricultural field north of the landfill and railroad tracks is located within the Kishwaukee River flood plain. Residential development is restricted and drinking water wells can not be installed. The local/county zoning ordinances and Boone County Health Department regulations can also be used to restrict groundwater drinking well installation. The IRM soil borrow pit property has development deed restrictions.

Natural attenuation/intrinsic remediation of groundwater: To remediate groundwater contamination and insure compliance with Illinois EPA and U.S. EPA groundwater and surface water regulations, numerous remediation components will be implemented. These components include, capping the landfill, reducing gas pressure within the landfill, the removal of leachate, and natural attenuation through the establishment of a GMZ north, northwest of the landfill. The establishment of a GMZ will allow for the natural attenuation of the contaminated groundwater by the natural organic content of groundwater as it flows through the GMZ towards the Kishwaukee River. The natural attenuation occurs when a variety of physical, chemical, or biological processes occur within the soil and groundwater to reduce the mass, toxicity, mobility, volume or concentration of contaminants in the soil or groundwater.

Natural attenuation is being provided at the Site by the combination of the interior Landfill environment and the lower permeability glacial till zone present beneath the refuse burial, as well as the higher permeability of the Interface Hydrostratigraphic Unit. This is evidenced by the much lower concentrations of VOCs and chlorides measured in groundwater at the Site, versus what was measured in the leachate well samples and what can be considered typical for

uncontrolled municipal landfills (USEPA, 1987b). Primary natural attenuation mechanisms include the following: adsorption to natural organic carbon content in the unsaturated zone glacial till soils; biodegradation in the vapor and adsorbed soil phases in the unsaturated zone and dissolved aqueous phase in the saturated zone; dispersion of the dissolved phase in the saturated zone; and immobilization/precipitation of metals present in the dissolved phase in the saturated zone resulting from changes in subsurface oxidation/reduction valence states as constituents migrate away from the presence and influence of landfill leachate. Given the existence of monitoring well data from the Landfill interior to the Kishwaukee River, the ultimate groundwater receptor, the RI data demonstrate the magnitude of the natural attenuation process.

To insure that effective natural attenuation occurs, source control (i.e., landfill capping, leachate surface impoundment leachate and sediment removal) and long-term performance monitoring of the groundwater will be performed. In addition, contingency measures requiring that additional remediation technologies be implemented are incorporated into the remediation process, in case natural attenuation and landfill capping do not result in the remediation objectives being met. For MIG/DeWane, the contingency plan will include an additional leachate withdrawal measure triggered by the exceedence of Groundwater Action Levels included in the Groundwater Monitoring Program part. The contingency plan includes the implementation of one or all of the following: (1) a landfill perimeter trench leachate extraction system, (2) horizontal leachate withdraw wells along the landfill perimeter, and (3) vertical leachate extraction wells within the landfill interior.

Groundwater Action Levels, Target Compounds for Natural Attenuation, and Contingent Leachate Removal: As was stated above in the Baseline Risk Assessment Section, groundwater action levels have been established to trigger a contingency plan for additional leachate removal, if natural attenuation is not effectively occurring. Sampling results from monitoring wells located immediately downgradient of the landfill perimeter will serve as the basis for determining the exceedence of an action level for purposes of triggering the contingent leachate removal plan. Groundwater action levels are specific levels of contaminant concentrations for specific contaminant target compounds. The target compound action levels have been designated as triggers for additional remediation if the action levels are met or exceeded, as determined by groundwater monitoring (see Long-term Groundwater Monitoring below for more details).

The initial groundwater action levels have been established to be protective of surface water, mainly to protect the Kishwaukee River. The baseline risk assessment did not find the groundwater media to represent a completed pathway for contaminants because the groundwater use is restricted. VOCs in groundwater, however, may constitute a potential risk component due to volatilization. An addendum to the baseline risk assessment is being developed to re-examine the VOCs as a potential risk component. Results from the addendum to the baseline risk assessment will be taken into consideration during the remedial design stage, to insure that the any potential risk is adequately addressed by the remedial alternatives.

The groundwater action levels include a 7 VOC target compounds, and each compound has two different groundwater action levels. There are separate groundwater action levels for the north groundwater pathway and for the west pathway. The action levels are based on surface water quality criteria. These target compounds and their respective action levels are presented in the table below.

SURFACE WATER QUALITY CRITERIA

Contaminant of Concern	Acute	Chronic	Human Health (Organisms)	Max. Detected West Pathway	Action Levels West Pathway	Max. Detected North Pathway	Action Level North Pathway
Benzene	5.2 mg/L	0.42 mg/L	*0.071 mg/L	0.011 mg/L	6.3 mg/L	0.012 mg/L	1.37 mg/L
1,1-Dichloroethylene	3.03 mg/L	0.242 mg/L	*0.0032 mg/L	<0.001mg/L	135 mg/L	0.001 mg/L	2.3 mg/L
1,2-Dichloropropane	4.8 mg/L	0.38 mg/L	*0.039 mg/L	0.01 mg/L	0.85 mg/L	0.006 mg/L	0.37 mg/L
Methylene Chloride	17 mg/L	1.4 mg/L	0.34 mg/L	0.01 mg/L	13000 mg/L	<0.001 mg/L	10333 mg/L
Tetrachloroethylene	1.2 mg/L	0.15 mg/L	*0.00885 mg/L	0.007 mg/L	0.88 mg/L	0.002 mg/L	0.18 mg/L
Trichloroethylene	12 mg/L	0.94 mg/L	*0.081 mg/L	0.01 mg/L	2.53 mg/L	0.006 mg/L	0.91 mg/L
Vinyl Chloride	NCE	NCE	*0.525 mg/L	0.012 mg/L	10.58 mg/L	0.028 mg/L	4.77 mg/L

* = Value obtained from the December 22, 1992 Federal Register (Vol. 57, No. 246) pages 60890, 60911, and 60912.

NCE = No Criterion Established

If the concentration level of any of the above target leachate constituents (compounds) meet or exceed the above listed levels, for two quarterly groundwater sampling events within any 4 consecutive quarters, then the exceedance will trigger the contingency leachate removal process that requires that alternative remediation measures be implemented. An evaluation of the situation will determine which elements of the contingency plan will be implemented. The contingency leachate removal would continue until groundwater contaminate levels return to the previous or lower levels.

It should be noted that in addition to the groundwater action levels based on surface water criteria, the Illinois EPA believes that the use of additional groundwater action levels based on the MCLs for COCs identified in the RI, baseline risk assessment, and the baseline risk assessment addendum results should be considered during any pre-remedial design study, and/or the remedial design stage. This issue has been raised based on concerns relative to the nearby subdivision and the Class I groundwater requirements. The groundwater action levels above are based on surface water criteria that are two to six orders of magnitude greater than the maximum detected levels for the seven listed compounds. It would also appear that it may be more appropriate for additional action levels to be set at the level that would clearly indicate that the monitored natural attenuation remedy is showing a decrease in contaminant concentration after a certain period of time. Using these criteria the action levels for the COCs should be closer to the

maximum detected levels detected. Any changes to the appropriate target levels will be specified after completion of the baseline risk assessment addendum. Additionally if a decrease in COC concentrations are not detected within the specific time frame, then additional leachate withdraw methods should be instituted.

Contingent leachate removal options identified in the FS include:

- A perimeter trench system could be constructed along key lengths proximate to identified areas of leachate contamination.
- Horizontal well laterals could be installed along the base of the western portion of the refuse burial.
- Passive gas vent wells located in identified areas of leachate accumulation could be retrofitted to operate as leachate extraction wells.
- Any combination of the three leachate removal alternatives described above could be implemented if the it is more cost effective than each of them separately.

Long-term groundwater monitoring: The long-term groundwater monitoring program will provide information on natural attenuation's progress towards achieving the clean-up objectives. The 7 chemicals of concern to be included in the groundwater monitoring program, as noted immediately above in the natural attenuation section, include: benzene: 1,1- Dichloroethylene; 1,2-Dichloropropane; methylene chloride; tetrachloroethylene; and vinyl chloride. The groundwater monitoring program would determine the effectiveness of the landfill cap, and the leachate and gas collection systems for the mitigation of leachate migration from the landfill interior. The plan to initiate additional leachate extraction from the landfill interior and/or perimeter would be triggered if target groundwater contaminants meet or exceed the groundwater action levels under the circumstances described above.

Because the extent of groundwater contamination is limited, it is believed that the groundwater cleanup objectives can be attained through these containment, removal, and natural remediation measures without directly treating the groundwater, within a time frame that is reasonable as compared to active measures.

The Groundwater Monitoring Program details will be refined during the Remedial Design stage. The groundwater monitoring program is based on the ARAR requirements of 35 IAC Parts 620 and 811/814. The objective of the monitoring program would be to assess progress toward the attainment of groundwater ARARs by monitored natural attainment.

Groundwater monitoring will be performed on a quarterly basis for at least the first 2 years in order to develop a data base of baseline conditions for comparative purposes and to observe any seasonal variations that may occur. The first 2 years of sampling and follow years of quarterly

sampling will be performed to evaluate monitored natural attenuation progress. Monitoring parameter will include VOCs, target inorganics, relevant water quality and natural attenuation evaluation parameters, and other parameters as approved by the Illinois EPA and U.S. EPA. The evaluation or "indicator" parameters will be monitored in addition to the chemicals of concern.

In general these parameters depend on the attenuation mechanisms that are being relied on to cleanup the groundwater (see Remediation Objectives section). For reductive dechlorination the indicator parameters should include dissolved oxygen, nitrate, iron (II), sulfate, methane, oxidation/reduction potential, and chloride as well as the expected degradation products (e.g., cis-DCE, vinyl chloride, etc.).

As discussed above, baseline groundwater concentrations at each of the monitoring wells would be determined using sampling results from eight consecutive quarterly monitoring events performed over the initial 2-year period following completion of the Remedial Action construction activities. The objective of this initial sampling over a 2-year period would be to gather sufficient level of data to develop a statistical representation of baseline groundwater quality and potential variations. The initial target constituent list for statistical baseline analysis would include organic and inorganic parameters that exceed Class I groundwater quality criteria for at least one baseline sampling event. However, as discussed above, the monitoring parameters from the initial baseline sampling events would include a more exhaustive list of organic, inorganic, and water quality and natural attenuation evaluation parameters as proved by the Illinois EPA and U.S. EPA. The target constituent list can be amended, as appropriate by the Illinois EPA and U.S. EPA based on continued long-term monitoring program results.

The long-term monitoring groundwater program would focus on the evaluation of monitored natural attenuation progress towards achieving identified chemical-specific ARARs (i.e., Class I groundwater quality criteria), as well as the effectiveness of the source control measures toward the mitigation of continued leachate migration from the landfill interior. The source control measures and monitored natural attenuation would be considered effective if groundwater contaminant levels and leachate levels within the landfill interior gradually decrease at a predetermined rate without resulting in a further degradation of overall groundwater quality.

Leachate piezometers would be installed within the interior of the landfill during the Pre-Design phase. Leachate potentiometric levels would be monitored during this phase to determine the baseline hydraulic conditions. These piezometers would continue to be monitored after the implementation of the remedy (i.e., completion of the landfill cap) to determine the dissipation rate of the accumulated leachate within the landfill interior. The monitoring frequency and the criteria for evaluating the dissipation rate would be established as part of the Remedial Design.

The chosen remedial alternative meet the remedial action objectives by combining active leachate removal and landfill capping to mitigate the leachate seep conditions and reduce future infiltration into the landfill. The reduction in infiltration rates would serve to both prevent the recurrence of future seep conditions by dissipating the accumulation of leachate levels within the

interior of the landfill, as well as enhance the natural attenuation capacity of the site hydrogeology. As previously mentioned, the current natural attenuation capacity for the landfill has already prevented more significant impacts to groundwater from occurring. A reduction in future infiltration rates would accelerate the monitored natural attenuation remediation process for groundwater towards attaining groundwater chemical-specific ARARs (i.e., Class I groundwater quality criteria). The landfill gas control system would address the potential future residents scenario described in the baseline risk assessment associated with uncontrolled landfill gas migration.

Summary of Landfill Capping Alternatives

Construction of a new cover/cap over the entire landfill will minimize the infiltration of precipitation into the landfill. The covering or capping of the landfill is a general remedial response action that is also described as a containment option. State and Federal regulations and ARARs (i.e., 35 IAC 811/814 and 40 CFR 258) require municipal landfills to be adequately covered. The required, relevant and appropriate environmental regulatory standards for the landfill capping action can be used to address the remedial action objectives associated with both the prevention of direct contact with refuse and the control of leachate. Landfill capping reduces the generation of leachate and migration of leachate, contaminants from the leachate and buried landfill refuse to the groundwater and surface waters, such as the Kishwaukee River. By minimizing the downward infiltration of precipitation into the landfill, landfill capping is an effective containment technology that prevents direct human contact with the landfill waste and reduces the infiltration of precipitation (i.e., snow, rain) and thus the corresponding leachate generation.

Each of the alternatives is listed and discussed in greater detail below:

Alternative 1 - No Action

Estimated Cost: none *Operation & Maintenance Activities: none*

As stated previously, the No-Action Alternative is required by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). Its purpose is to allow comparison of this alternative to other alternatives and to conditions that currently exist and that will likely exist in the future. No active remedial response actions would occur beyond those that presently exist at the site. This alternative would include leaving the interim response cap in place without the implementation of additional capping or control technologies (e.g., gas extraction or leachate collection). The current institutional controls include such items as fencing for site security, zoning and health ordinances that restrict land and groundwater usage would continue. Deed restrictions for land use are already in place for the soil borrow area west of and adjacent to the landfill. The soil borrow area is also part of the Groundwater Management Zone for site remediation.

The No Action Alternative would allow for the continuation of groundwater contamination for an indefinite period of time, leachate seeps, exposed refuse, surface water contamination, landfill gas generation and migration, and allow the leachate surface impoundment to remain.

The No-Action Alternative would not directly reduce the current and possible future levels of leachate within the landfill. The partial interim cap was previously constructed as a short term emergency procedure has not been protected from the effects of numerous rounds of freezing and thawing, desiccation, burrowing animals, plant root penetration, and erosion due to the absence of additional protective layers. Continual unprotected exposure of the partial landfill cap to the natural elements will allow, and may already have allowed, the infiltration of precipitation into the interior of the landfill, resulting in the generation of additional leachate. The present absence of an adequate cap on the landfill crest and the side slopes can and has resulted in the localized accumulation and seeping of leachate. The absence of adequate soil cover and improper grading to address surface water run-off does pose a long-term damage problem for the side slopes. Isolated areas of exposed refuse and erosion gullies have been observed. The uncontrolled release of landfill gas through the inadequately covered side slopes, and possibly through the weakened areas of interim cap, can cause stress to the current vegetative cover on the landfill. The stress to the vegetative cover could further exacerbate the erosion and cause further deterioration of the present soil cover.

The No-Action alternative, as described above for the present partial landfill cap does not comply with 35 Illinois Administrative Code ARAR requirements 811 and 814, and it does not meet the more limited and less protective requirements of 807, in that soil cover depth does not meet the minimum requirement of two feet of soil on all areas of the landfill, in that only the landfill crest 17 acres is covered with two feet of soil. Some areas on the side slopes of only 6 inches of soil or less. As a result of the present cap inadequacies, source control of contaminants located within the landfill would not occur because the landfill side slopes do not have an adequate depth of soil cover. The inadequate soil depth would allow for precipitation to filter through the landfill, thus generating more leachate and causing additional groundwater contamination, In general, this alternative is not protective of human health and the environment to the extent required by the regulations.

Alternatives 2A and 2B

Alternative 2A Landfill Cap Details

Total Alternative 2A Costs include:

Cap Construction	$4,545,600
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000

Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222,311
Operation and Maintenance	$3,089,862
Total 2A Costs	$13,748,624

Alternative 2A involves leaving the older interim cap in place as is on the crest of the landfill, but extending the original cap to include the side slopes in order to provide adequate soil cover to mitigate leachate seeps. This would require that the side slopes would first be graded to provide a more uniform slope and run-off control to minimize future erosion damage to the cap. After grading, a two-foot compacted clay cap would be constructed over the graded landfill side slopes to cover the horizontal extent of buried refuse. A geosynthetic drainage layer would be installed on the side slopes only. Next a minimum of six inches of top-soil would be placed over the compacted clay to support vegetative growth to minimize erosion.

Alternative 2B Landfill Cap Details:

Total Alternative 2B Costs include:

Cap Construction	$8,866,250
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000
Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222.311
Operation and Maintenance	$3,089,862
Total 2B Costs	$20,387,108

Alternative 2B is a variation that includes all of 2A plus the inclusion of a thirty-inch soil freeze-thaw protection layer (plus the minimum of six inches of topsoil vegetative layer) over the landfill crest and side slopes. The three-foot frost protection layer would protect the two-foot compacted clay cap layer from the effects of freezing and thawing that over time may damage the underlying two-foot compacted clay layer. The average soil frost/freeze depth for winters in northern Illinois is three feet. The State of Illinois requires the three-foot freeze protection later for municipal landfills, as per 35 IAC Part 811. The 811 regulations were instituted to replace inadequacies found in the older 807 regulations. In addition to the additional depth of soil, between the two soil layers a geosynthetic drainage net layer would be installed on both the top and side slopes of the landfill. The drainage layer would allow for precipitation that accumulates in the freeze protection layer to drain away from the underlying clay layer. Under the appropriate circumstances, a one-foot sand drainage layer could be substituted for the geosynthetic net.

Alternatives 3A and 3B

<u>Alternative 3A Landfill Cap Details</u>

Total Alternative 3A Costs include:

Cap Construction	$7,277,650
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000
Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222,311
Operation and Maintenance	$3,089,862
Total Alternative 3A Costs	$18,277,056

In addition to the non-cap remedial action components for landfill gas and leachate remediation, noted above, Alternatives 3A and 3B include the following additional landfill cap options.

Alternative 3 A involves extending the interim cap (2ft. of compacted clay) from the top of the landfill onto the side slopes in order to provide adequate soil cover to mitigate leachate seeps. The side slopes would be graded to provide a more uniform slope and to control storm water runoff to minimize future erosion damage to the cap. A two-foot compacted layer of clay soil would be constructed to form a cap over the landfill side slopes to insure adequate cover of the buried refuse. On top of the two-foot side slope cap a six-inch top-soil layer for vegetation would be placed. The vegetative layer will minimize the absorption of precipitation, thus reducing the generation of leachate within the landfill. A thin geosynthetic net drainage layer would be placed only on the side slopes. These components are common to Alternative 2A.

In addition, over the top of the two-foot thick compacted clay interim cap, a second layer would be placed. This second layer is a Geosynthetic Clay Layer (GCL). The GCL is a relatively thin layer of processed clay (typically bentonite) either bonded to geomembrane or fixed between two sheets of geotextile or geotextile and a geosynthetic geomembrane called a flexible membrane liner (FML). A geomembrane is a polymeric sheet material that is impervious to liquid as long as it maintains its integrity. A geotextile is a woven or non-woven sheet of material less impervious to liquid than a geomembrane, but more resistant to penetration damage.

The inclusion of a GCL secondary barrier over the two-foot compacted interim cap would reduce the infiltration of precipitation (snow melt and rain water) into the underlying clay cap, thus protecting the integrity of the interim cap layer from moisture damage, and resulting in the reduction of leachate generation and groundwater contamination. Alternative 3A includes all of Alternative 2A plus the GCL barrier.

Alternative 3B Landfill Cap Details

Total Alternative 3B Costs include:

Cap Construction	$9,687,250
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000
Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222,311
Operation and Maintenance	$3,089,862
Total Alternative 3B Costs	$21,719,025

Alternative 3B includes all of Alternative 3A plus a thirty-inch freeze protection soil layer with a six-inch top soil vegetative layer on top of the two-foot compacted clay interim cap layer, the geonet drainage layer, and the GCL barrier layer. The details of the thirty-inch freeze protection soil layer with the six-inch vegetative layer are included above in Alternative 2B. The GCL layer would not be extended over the landfill side slopes.

Alternative 4

Alternative 4 Landfill Cap Details

Total Alternative 4 Costs include:

Cap Construction	$6,815,950
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000
Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222,311
Operation and Maintenance	$3,089,862
Total Alternative 4 Costs	$16,829,193

This option includes the previously installed interim cap (two-feet of compacted clay), located only on the top of the landfill, and not on the slopes. The side slopes would be graded to provide a more uniform slope and run-off control to minimize future erosion damage and provide a proper surface for the installation of the Geosynthetic-Clay Layer (GCL). The GCL used will contain a treated bentonite (clay) layer sandwiched between a woven, geotextile fabric component layer and a geomembrane component on top. A geosynthetic drainage net layer would be installed over the GCL and the entire landfill. The geo-net layer would provide drainage for precipitation that would infiltrate the landfill from snow or rain, thus further reducing leachate generation and groundwater contamination. Because the GCL would not provide sufficient counterweight to prevent leachate seeps from leachate already accumulated within the landfill, an additional soil layer consisting of a minimum soil depth of 18 inches will be used to cover the GCL. The leachate monitoring data collected during the Pre-Design phase would be used to specify the soil types, thickness, and any compaction requirements for the cover layer in order to provide adequate protection against the recurrence of leachate seeps. The eighteen (18) inch soil cover protective layer will include a twelve layer soil layer combined with six inches of topsoil as a vegetative layer.

Alternative 4A

Alternative 4A Landfill Cap Details

Total Alternative 4A Costs include:

Cap Construction	$7,461,950
Leachate Piezometer and Gas Probe Installation	$88,600
Leachate Bed Construction	$1,220,000
Gas Collection System	$419,000
Closure of Surface Impoundment	$163,250
Engineering and Construction	$4,222,311
Operation and Maintenance	$3,089,862
Total Alternative 4A Costs	$17,475,193

Alternative 4A is an option not included in the FS. This option is proposed by the Illinois EPA as a modification to Alternative 4 to assure that the detailed design for the site remedy is developed to satisfy ARARs, remedial action objectives, and Illinois EPA performance criteria, so that the performance, implementability, and cost-effectiveness of the remedy can be optimized. Alternative 4A is a compromise between Alternatives 4 and 5, with the difference being that the soil cover be a minimum of 30 inches in depth on top of the landfill and be allowed to taper to 24 inches minimum at the toe of the landfill. The 24 inches at the toe of the landfill will be allowed due to slope restrictions caused by the landfill cap's proximity to the property boundaries and physical barriers such as railroad tracks and fiber optic underground cables. The geomembrane, as the top component of the Geosynthetic Clay Layer ("GCL"), will protect the bentonite layer of the GCL from root penetration, desiccation, erosion impacts, and burrowing animals. The proposed soil protective layer depths are expected to provide a safeguard against long-term environmental degradation of the GCL, provide the necessary depth for good vegetative root growth, minimizing erosion and thus protecting the GCL. Good vegetative growth is necessary to minimize soil erosion of the cap. Before the GCL is placed, the old interim cap, consisting of two feet of compacted clay on the crest of the landfill will be repaired where necessary, and the side slopes will be backfilled and covered with a minimum of 12 inches of compacted soil for the cap's subsoil/grading (foundation) layer. Up to six inches maximum depth of soil may be removed from the two feet of clay crest, to be used on the sideslopes. This work will be undertaken to insure adequate cover soils over areas that have eroded, and/or contain leachate seeps or have exposed refuse. The subsoil/grading layer will be properly prepared to protect the GCL from the landfill contents and items in the soil such as large dirt clods, rocks, and roots. Alternative 4A will substantively meet the Illinois EPA regulations and ARARs requirement for 35 IAC, Subpart C, Section 811.314(c)(2).

Alternative 5

Alternative 5 Landfill Cap Details

Total Alternative 5 Costs include:

Cap Construction	\$8,142,750
Leachate Piezometer and Gas Probe Installation	\$88,600
Leachate Bed Construction	\$1,220,000
Gas Collection System	\$419,000
Closure of Surface Impoundment	\$163,250
Engineering and Construction	\$4,222,311
Operation and Maintenance	\$3,089,862
Total Alternative 5 Costs	\$18,792,446

Alternative 5 is technically identical to both 4 and 4A, in all aspects except it includes a protective soil cover of 36 inches in depth over the top of the GCL, and does not require a minimum 12 inches of subsoil. Alternative does include a grading/subsoil layer of about 6 inches in depth. This alternative complies with Illinois regulations and ARARs. It differs from Alternative 4 which requires a soil cover of only 18 inches and Alternative 4A which requires a soil cover of only 30 inches on top of the landfill, with a decrease to a 24 inches at the bottom of the landfill slopes.

X. Comparative Evaluation of Alternatives

This section represents an analysis of the remedial alternatives listed above. The analysis provides information to compare alternatives and demonstrate satisfaction with the CERCLA remedy selection requirements and the nine evaluation criteria. Capping Alternative 4A, in combination with common non-cap components of the Remedial Action, meets the nine criteria better than any other capping options that were combined with the common remedial components.

The common non-cap components of the Remedial Action, in combination with the respective capping options, address the remedial action objectives by mitigating the leachate seep conditions, preventing direct contact with buried refuse and impacted liquids and sediments, providing institutional controls that would not allow future development of the landfill and in the IRM soil borrow pit on the west because of the contaminated groundwater, intercepting uncontrolled gas migration towards the residential homes to the west, and minimizing future migration potential of leachate constituents to groundwater.

For the common non-cap components of the remediation there is no comparative analysis since all of the non-cap components of remediation are used in conjunction with each of the capping options. The common non-cap components of the remediation are considered to be a shared or common component of each capping option, and it is the combined remedial components of each capping remedial alternative that are evaluated using the nine criteria.

Analysis

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1: Alternative 1 (No Action Alternative) would not be protective of human health and the environment because the alternative would not prevent exposure to site contaminants both on-site and off-site. Alternative 1 only includes leaving the IRM cap in place, institutional controls , and monitored natural attenuation. Even though Alternative 1 would provide some level of overall protectiveness, it would not address leachate seeps or completely control landfill gas migration even though the active gas system has already been installed. Gas can migrate through the landfill sideslopes where there is inadequate soil cover. The present cap is inadequate to reduce the infiltration of precipitation to the interior of the landfill and would not further reduce the migration of potential contaminants to groundwater. The contaminated groundwater could pose a risk to the Kishwaukee River ecosystem. Leachate seeps can still be observed at the landfill. In addition, areas of exposed refuse, and leachate contaminated soils are evident along the landfill side slopes where insufficient soil cover presently exists. Trespassers could be at risk due to the surface impoundment. Leachate that could flow off-site could also pose a risk.

Alternative 2A: Alternative 2A would not be protective of human health and the environment since it may not provide a reliable means of preventing exposure to site contaminants over time. It would not allow for adequate protection of the landfill cap's compacted clay layer from various types of damage including freeze-thaw cycles, desiccation, animal burrowing, plant root penetration, and erosion. The integrity of the landfill cap would be a problem. Also, this alternative does not provide for adequate storm water drainage, nor adequately reduce precipitation infiltration that could result in additional leachate contaminants moving into the groundwater. It would, however, be expected to reduce infiltration rates versus the initial uncontrolled conditions by 74% to 95%. Localized areas of leachate seeps may continue to be a potential problem. Gas migration could be a potential problem due to the inadequate depth of the soil cover and the porous nature of soils. Alternative 2A is a single barrier cap. Also, this cap may not be able to eventually meet the Class I groundwater criteria, nor-prevent leachate seeps.

Alternative 2B : The Alternative 2B landfill cap would be expected to be provide more protection than alternative 2A, because it is a two barrier cap that includes a protective soil layer to cover

the compacted clay layer. However, the cap may not be overall protective. Alternative 2B would be expected to reduce infiltration rates by only approximately 89%. This level of expected infiltration reduction is one of lowest, and therefore one of the least protective rates. This infiltration rate level of reduction would not meet the MCL for vinyl chloride. Also, alternative 2B Would result in implementability problems because the cap would extend offsite.

Alternatives 3A and 3B: Alternatives 3A and 3B and their capping approaches would be more protective of human health and the environment than Alternative 1, in that both considerably reduce infiltration of water into the landfill, and offer some improvement over the single barrier clay cap system of Alternative 2A. It is estimated that Alternative 3A would reduce infiltration from between 90% to 99% under optimum conditions. It should be feasible to ultimately attain Class I groundwater quality criteria for either cap options. However, 3A would not meet the Class I groundwater criteria for vinyl chloride that requires at least a 93% reduction in infiltration rates, therefore it may not be adequately protective of human health and the environment. Alternative 3A, however does not include a protective soil layer over the GCL on the landfill crest, nor for the compacted clay soil on the landfill sideslopes. Alternative 3A is subject to degradation from freeze-thaw cycles, and erosion, leachate seeps and burrowing animals on the sideslopes. With only 6 inches of soil over the GCL, it would not allow for adequate vegetative growth to hold the soil in place, thus resulting in erosion problems and exposing of the GCL. Without an adequate protective soil layer, the long-term integrity of the cap may be in question. Also, the cap would not provide sufficient counterweight to prevent leachate seeps. Alternative 3B could result in a precipitation reduction of only about 94%, which is borderline for eventually in meeting the vinyl chloride MCLs . This is in the mid-range for precipitation reduction. The cost for Alternative 3B is the highest of all capping options.

Alternative 4: Alternative 4 may be protective of human health and the environment. The reduction of infiltration into the landfill is expected to be 97% to 99%. It should be feasible to ultimately obtain Class I groundwater criteria with this cap, if cap integrity can be maintained. There is concern, however, that the proposed 18 inch protective soil layer will be inadequate to maintain the long-term integrity of the GCL and protect it from freeze-thaw cycles. There also is some concern that the cap may not provide sufficient counterweight to prevent leachate seeps. This capping option is the second least expensive.

Alternative 4A: Alternative 4A would be protective of human health and the environment; and possibly the most protective. The reduction of precipitation into the landfill would be expected to be between 97% and 99%. The cap would be protective of human health and the environment and play a major role in cleaning the groundwater ultimately to Class I groundwater criteria levels, by effectively reducing leachate generation and contaminate migration. This cap option provides an adequate protective soil layer depth for the GCL component of the cap against the effects of freeze-thaw cycles, thus maintaining cap integrity. The cost of this capping option falls within the mid-range of costs.

Alternative 5: Alternative 5 would be protective of human health and the environment. The

reduction of water infiltration into the landfill is expected to be 99% . This cap option provides an adequate protective soil layer depth for the GCL component of the cap against the effects of freeze-thaw cycles, thus maintaining cap integrity. However, there would be technical difficulties in constructing this cap due to landfill boundaries and physical barriers. The cost is estimated to be more expensive than Alternative 4A.

Compliance tvith Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

ARARs can be chemical-specific, action-specific and location-specific. In addition to the chemical-specific ARARs for soil/sediment, groundwater and surface water, the action-specific ARAR for landfill closure requirements have a significant role for this Site. This is especially due to the history of the Site. The interim cap did not meet 35 IAC, Part 807 for the landfill side slopes, nor did it meet any of the requirements for 35 IAC, Part 811/814.

Illinois' 35 IAC Part 807 requirements were effectively replaced by more stringent landfill requirements under 35 IAC Parts 810-815, effective on September 18, 1990. The new Illinois landfill regulations were passed, in large part, to address landfill cap failures under the old Part 807 standards. In general, the new Illinois regulations were more extensive and more stringent than the federal RCRA Subtitle D landfill standards (which were effective October 9, 1991). The Illinois regulations were revised to incorporate the aspects of RCRA Subtitle D that were not already covered by Illinois law, and allowed Illinois to implement Subtitle D.

The new Illinois standards had certain grandfather provisions. In particular, Part 814, Subpart E of the 1990 regulations allowed existing facilities to close under the old regulations (35 IAC 807) if closure was initiated by September 18, 1992.

Although the operators of the MIG/DeWane landfill did not initiate closure prior to the landfill being abandoned in 1988, the landfill did stop receiving wastes prior to 1992. Originally, the landfill may have been entitled under state law to close under the old 807 closure standards. However, federal law provides that when hazardous wastes will be left at a site, state and federal requirements that may not be directly applicable, may still be relevant and appropriate to the circumstances of the release. Apparently the landfill, although permitted to do so at the time, received wastes containing hazardous constituents. This same situation occurred at many Municipal landfills prior to the enactment of the RCRA regulations of 1980.

If a standard, or a portion of a standard, is relevant and appropriate, then that standard (or portion thereof) must be attained by the remedy just as if the standard were directly applicable, The Ill. EPA and the U.S. EPA determined that the landfill cap and other provisions of Part 35 IAC 811/814 are relevant and appropriate due to the circumstances of the release of chemical

contaminants.

Due to the dates during which waste was disposed of within the landfill, 35 IAC 807 may be considered the only directly applicable regulations. However, it is entirely appropriate to follow the detailed requirements specified in the 35 IAC 811/814 regulations in order to comply with the general requirements of the older 807 regulations that lack details. For example, the old regulations only have general provisions prohibiting threats of air pollution (807.312) and water pollution (807.313 & 870.315). Specific requirements describing details for gas collection, leachate collection and monitoring of air and groundwater are lacking. Yet, those systems may be necessary to comply with the old general provisions. It is both relevant and appropriate to follow the more detailed standards found in 34 IAC 811/814 to provide for a more environmentally sound landfill system.

The Illinois EPA and the U.S. EPA believe that 35 IAC 807 is applicable and that 35 IAC 811/814 are relevant and appropriate. The Site was abandoned and presented a sufficient hazard to human health and the environment to be placed on Superfund's list of national priorities. At the time of its listing on the NPL the site did not have a landfill bottom liner, adequate landfill gas controls, any significant long-term maintenance, nor capping materials impermeable enough to protect groundwater, or protection of the cap from freeze-thaw or wet-dry cycle (which would ultimately impact cap integrity). Groundwater at the Site became contaminated at levels exceeding federal and state action limits. Although interim measures were initiated in 1991 to stabilize the site and reduce infiltration of water, only a partial cap was placed on the landfill and it did not fully meet the 807 requirements for the landfill side slopes, but only for the landfill crest or about 1/3 of the landfill area. The existing partial cover, or interim cap has been subjected to repeated freeze-thaw and wet-dry cycles and needs to be repaired and reconstructed to meet the 811 standards.

Alternative 1: Alternative 1 does not comply with the 35 IAC 807 requirements nor with the 35 IAC 811 ARARs for landfills. Even after the interim cap work of 1992/3, the landfill does not comply with Section 807.305 (Cover), Section 807.312 (Air Pollution), Section 807.313 (Water Pollution), and Section 807.315 (Protection of Waters of the State). Until contaminant concentrations are reduced to acceptable levels through gas removal, leachate removal, landfill capping, waste containment, and the natural attenuation mechanisms for groundwater, the requirements of 35 IAC Parts 811/814, as well as various other regulations would not be met. This alternative also would not meet the 35 IAC 620 groundwater regulation ARARs.

Alternatives 2A and 2B: Alternative 2A does not comply with ARARs for remediating the landfill until contaminant concentrations are reduced to acceptable levels. The proposed cap does not meet the requirements of 35 IAC Parts 811/814. Alternative 2B may meet the 620 ARARs for the upper range for infiltration rate reduction, but the low range of the infiltration rate reduction estimated would not meet the MCLs for vinyl chloride, thus it would not comply with the 620 ARAR. The cap would not be adequate to effectively reduce the generation of leachate, and thus groundwater contamination. Alternative 2B would not comply with the requirements of

35 IAC Parts 811/814.

Alternatives 3A and-3B: Alternatives 3A do not comply with 35 IAC Parts 811/814. Alternative 3A does not provide adequate protection from the affects of freeze and thaw, thus the cap integrity would not meet the regulations required by 811. The range estimated for the infiltration rate is too low and that low end of the range to effectively remediate vinyl chloride and meet the groundwater regulations, 35 IAC 620. Alternative 3B meets the 811 requirements, put would not meet the 620 ARARs.

Alternative 4: Alternative 4 does not comply with 35 IAC Parts 811/814, in that the depth of the protective soil layer cover over the GCL would be inadequate, and may result in the failure to eventually comply with 620 ARARs.

Alternative 4A: Alternative 4A does more fully comply with 35 IAC Parts 811/814, in that the depth of protective soil layer cover in combination with the GCL would be adequate to meet the 620 ARARs.

Alternative 5: Alternative 5 does comply with 35 IAC Parts 811/814 and would be expected to meet the 620 ARAR.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Alternatives 1, 2A and 3A: Alternative 1 would not provide the required long-term effectiveness and permanence due to inadequate depth of soil cover, inadequate protection from freeze-thaw cycles, etc.,(see details above in the Overall Protection of Human Health and the Environment section). For 2A and 3A, the long-term integrity of the cap design is also doubtful. The lack of adequate cap integrity would result in continued exposure of refuse, excessive leachate generation, and the continuing contamination of groundwater above the MCLs.

Alternatives 2B and 3B: These two alternative would provide better containment of the contaminants, then alternatives 1, 2A and 3A, and reduce the generation of leachate. However, the long-term effectiveness and permanence may not be adequate since they do not meet the recommended minimum cap design requirements to adequately reduce groundwater infiltration to allow for a reduction in leachate generation levels. Without an adequate reduction in leachate generation, natural attenuation would not be able to reduce all groundwater contaminants to eventually meet the MCLs.

Alternative 4: This alternative may not provide for adequate long-term protection of the critical component of its cap design, the GCL; therefore it would not appear to meet this criterion. The

inadequate depth of protective soil cover may result in damage to the GCL layer, resulting in the excessive infiltration of precipitation into the landfill. The excess infiltration of precipitation would result in leachate being generated and contaminating the groundwater.

Alternative 4A: The selection of this alternative will incorporate a more protective cap by providing a thicker or deeper protective layer soil layer, resulting in better vegetative rooting, thus less precipitation infiltration into the landfill. Freeze-thaw protection of the GCL layer would also be enhanced. This option is expected to provide for the necessary long-term effectiveness and permanence required by the nine evaluation criteria.

Alternative 5: This cap design would comply with the required regulations for landfill cap design that are designed to achieve long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume through Treatment
Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

The leachate collected at the landfill via gravity flow wells will be either treated onsite or transported offsite for treatment at a permitted wastewater treatment facility. Landfill gas can be treated by both venting and flaring (combustion) on site:

The natural treatment involved in all the alternatives is the capacity of the soils in the GMZ north of the landfill to effectively naturally attenuate the groundwater contamination before contamination, above regulated levels, reaches the Kishwaukee River. For natural attenuation to effectively occur, not only must the soil be capable to do the work, but also the source of the contamination must be effectively contained, such as through the construction of an appropriate landfill cap. The appropriate landfill cap would limit water (i.e., rain, snow) infiltration into the landfill, thus reducing leachate generation to manageable levels. In addition, all alternatives, except for Alternative 1, include the installation of additional leachate and gas removal. With the appropriate cap coupled with leachate and gas removal technologies, the volume and mobility of leachate and gas should be reduced, thus also reducing the migration of contaminants to groundwater.

Alternatives 1, 2A and 3A: Alternative 1 would not meet this criterion. Alternatives 2A and 3A would not be able to meet this criterion if the thickness, permeability and long-term integrity of the cap are questionable as to their adequacy.

Alternatives 2B, and 3B: Alternatives 2B and 3B would probably meet this criterion in the short-term, but may be not in the long-term if there is cap integrity problems.

Alternative 4: Alternative 4 would most likely meet this criterion, if the long-term integrity of the landfill cap can be maintained.

Alternative 4A: Alternative 4A would meet this criterion, since it would reduce the infiltration of precipitation through the use of a cap which offers greater long-term effectiveness and permanence.

Alternative 5: Alternative 5 should meet this criterion, as described above.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1: Since no additional remedial actions would be performed, short-term risks could occur to trespassers if they entered the surface impoundment. Therefore this alternative does not provide adequate short-term effectiveness.

Alternatives 2A-5: Construction of the final cover system, including leachate and gas withdraw scenarios, include the potential for exposure of waste and direct contact by construction workers on-site. There is also the potential for the limited release of landfill gas and volatilization of organic compounds into the atmosphere, which could potentially affect downwind residences. Possible exposures would be minimal and monitored. Alternatives 2A-5 should met the short-term effectiveness criterion. Generally all of the alternatives could be constructed in 9 months or less, if started early in the construction season (Spring) and no weather related problems occurred.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternatives 2-5 for capping and the other common components for site remediation all involve commonly used construction materials and techniques for Superfund landfills. There are issues associated with the construction of Alternatives 2A-5 for the side slope cap construction due to the close proximity of the adjoining property boundaries and railroad and utility right-of-ways. In order to completely cover the delineated extent of buried refuse and maintain the required grading contours to properly promote surface water runoff, the final cover would have to extend very close, or into, the railroad and utility right of ways for all alternatives. For those alternatives without a final protective soil layer (2A, 3A, and 4) the perimeter of the cap would not extend as far as Alternatives 2B, 3B, or 5. Alternative 4A will be designed to include an adequate protective soil layer with a final cover that stays within the property boundaries. For the northern landfill slope and property boundary where the cap would extend up to on into the railroad and utility right-of-ways, if these constraints cannot be resolved, the following options to completing the cap construction are available:

- Construction of a retaining wall or use of sheet piling to a height sufficient to contain the extended cap layers at the property boundaries.

- Contour the cap construction in such a manner that it terminates at the property boundary, and place a GCL and a lesser amount of soil cover over any portions of delineated refuse not directly covered by the final cap.

- Excavate a sufficient amount of refuse along the northern side of the landfill to allow the final cap perimeter and necessary surface water diversion ditches to be constructed within the property boundary, and reconsolidate the excavated refuse beneath the final cap along flatter side slopes within other portions of the landfill.

Cost
The costs for the various alternatives are given along with the descriptions of each individual alternative. There are considerable differences in the prices for the alternatives within each operable unit. Note that some of the alternatives may have a relatively large capital (initial) cost but a small yearly operating cost; or an alternative may have a small capital cost but a relatively large operating cost. The most effective way of evaluating these costs is to use the alternatives' "Net Present Value."

The Net Present Value Costs estimates range from $13,748,624 for Alternative 2A to $21,719,025 for Alternative 5. These costs include Cap Construction Cost, Total Capital Cost, and Net Present Value of Operation and Maintenance Cost. Included in the Total Capital Cost are the following: installation of monitoring systems, leachate collection beds, and gas collection system, as well as surface impoundment closure.

<u>Alternative 1</u>: Cost would be limited to the remedial working already performed on and near the site.

<u>Alternative 2A</u>: The estimated total cost is $13,748,624. The lowest except for Alternative 1.

<u>Alternative 2B</u>: The estimated total cost is $20,387,108. The cost associated with this alternative is the second highest overall.

<u>Alternative 3A</u>: The estimated total cost is $18,227,056. This cost falls within the high end of the mid-range of costs.

<u>Alternative 3B</u>: The estimated total cost is $21,719,025. This cost is the highest cost of all the available options.

<u>Alternative 4</u>: The estimated total cost is $16,829,193. This cost is at the high end of the low range for the options.

Alternative 4A: The estimated total cost is $17,475,193. This cost is approximately within the middle of all estimated costs for the available options.

Alternative 5: The estimated total cost is $18,792,446. This cost is at the low end of the high range for the options.

Support Agency Acceptance

The United States Environmental Protection Agency concur with the selected remedy. Illinois EPA presently has the technical lead role, with the federal government providing the enforcement lead role during the RI/FS, PP and ROD process. Starting with the RD/RA, the Illinois EPA will have both the technical and enforcement leads.

Community Acceptance

The surrounding community accepts the remedy selected. The reaction to the remedy is further described in the Responsiveness Summary at the end of this Record of Decision.

XI. Principal Threat Wastes

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The MIG/DeWane landfill does not contain principal threat wastes.

Wastes that generally will be considered to constitute principal threats include, but are not limited to, the following:

Liquid source material - waste contained in drums, lagoons or tanks, free product in the subsurface (i.e., NAPLs) containing contaminants of concern (generally excluding groundwater).

Mobile source material - surface soil or subsurface soil containing high concentrations of chemicals of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or subsurface transport.

Highly-toxic source material - buried drummed non-liquid wastes, buried tanks

containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include, but are not limited to, the following:

Non-mobile contaminated source material of low to moderate toxicity - surface soil containing chemicals of concern that generally are relatively immobile in air or ground water (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting.

Low toxicity source material - soil and subsurface soil concentrations not greatly above reference dose levels or that present an excess cancer risk near the acceptable risk range were exposure to occur.

The MIG/DeWane landfill site does not contain principal threat wastes. This landfill is a Type I landfill as is described in the U.S. EPA guidance document, *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites* (EPA/540/p-91/001,February 1991).

XII. Summary of Selected Remedy

Summary of Rationale for the Selected Remedy

As stated previously, the selected remedy uses numerous common remedial components for the leachate collection and monitoring system, for the landfill gas collection and monitoring system, for the leachate surface impoundment closure, the site surface water diversion system, the implementation of access restrictions and institutional controls, the natural attenuation of groundwater, and long-term groundwater monitoring. The nine criteria served as the basis for conducting the alternative screening and detailed analysis. The chosen remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria. The chosen landfill cap alternative, 4A, along with the identified common non-cap remedial action components provide the best option for providing an appropriate level of containment and long-term overall protection of human health and the environment.

Description of the Selected Remedy

The selected remedy is the common non-cap remedial action components and the Alternative 4A cap. The non-cap and cap Alternative 4A remedial actions include the following:

- Construction and operation of a leachate collection and monitoring system.

- Construction and operation of an active and passive landfill gas collection system and monitoring program.

- Leachate surface impoundment closure.

- Surface water diversion system.

- Implementation of access restrictions and institutional controls.

- Natural attenuation of groundwater.

- Long-term groundwater monitoring.

- Construction of a new cap over the entire landfill to minimize the infiltration of precipitation into the landfill.

This remedy is an improvement over Alternative 4 due to the following two differences:

(1) Alternative 4A provides for an increase in the overall soil cover depth from the eighteen inches to thirty inches on the landfill crest and a tapering of the soil depth from thirty inches at the top of the side slopes, down to twenty-four inches at the landfill toe; and

(2) The backfilling and covering of the side slopes with a twelve-inch minimum depth compacted subsoil/grading layer.

Although Alternative 4 does specify that a grading layer will be placed, it provides for neither a minimum soil depth, nor compaction requirements. The components of Alternatives 4A, with the identified soil depth modifications, are described below, along with a brief explanation of the advantages over the other listed alternatives.

The Alternative 4A landfill cover alternative, with its soil depth modifications, was chosen, in part, to insure adequate reduction of groundwater infiltration into the landfill, thus reducing leachate and landfill gas generation, and reducing the contamination of groundwater by leachate. It was also chosen because Alternative 4A is more protective of the GCL than Alternative 4, while not being as costly as the Alternative 5 landfill cover. The Alternative 4A landfill cap comprises a 2 1/2-foot soil protection and vegetative layer on the crest of the landfill with a taper to a 2-foot protection layer at the toe of the slope. In addition, a geosynthetic (geonet and geotextile) drainage layer, a composite barrier layer consisting of a geosynthetic clay liner between a geosynthetic flexible membrane and a geotextile layer will be required. These layers will be placed over the older interim two feet thick soil cover that already exists on the landfill crest and a subsoil/grading layer for a subgrade to be placed on the side-slopes.

Up to six inches of the cover clay from the existing cap will be removed and stockpiled for use as material for the final capping of the landfill side-slopes. The remainder of the older interim two feet compacted soil cover will be regraded and repaired as is necessary to provide a proper base for and the protection of the other cover layers to be included in the cover system. The landfill slide-slopes will be backfilled as necessary to cover exposed refuse, repair erosion gullies, and to mitigate leachate seeps. A compacted soil layer, with a minimum depth of twelve inches will comprise the subsoil/grading layer to establish a protective base or foundation for the GCL components. The existing interim cap on the crest of the landfill will be recompacted.

A soil foundation layer will be constructed across the landfill at a level immediately beneath the cover system hydraulic barrier layer. The functions of this layer are to cover exposed waste, achieve required final grades, provide a smooth, firm foundation for overlying cover system components, protect cover system components from buried waste, and support construction equipment with minimal rutting. Required foundation material property, layer thickness, and compaction requirements, subgrade proofrolling, requirements, required grades and construction tolerances and other necessary design criteria to demonstrate acceptable layer performance will be established through the use of guidance documents, pre-design studies and the remedial design process. This will be done in order to provide a firm soil foundation suitable for installing the final landfill cover, which will consist of the GCL, drainage layer, protective layer and vegetative layer.

As part of the remedial design, Interim Remedial Measures (IRM) cap material or underlying grading fill may be considered for use as foundation layer material for the landfill side slopes. Soil material from the top of the landfill will only be used for this purpose to the extent that the remaining cap material thickness satisfies all applicable design criteria including all foundation layer criteria, permeability criteria as appropriate, and final grading criteria. In no case will the post-excavation IRM cap material thickness on top of the landfill be less than twelve inches. After soil removal, the surface of the remaining soil will be graded, scarified, moisture conditioned if necessary, and compacted to satisfy the engineering specifications developed during the remedial design.

The side slope soil cover and grading layer will protect the other cover layers from possible damage from the landfill's contents, freeze-thaw, intrusion (animal and human), root penetration, and vegetative growth. The cover will also serve to provide slope stability. ARARs pertaining to the 35 Ill. Adm. Code require a minimum of two feet compacted soil on side slopes (807) and more for 811.314 (c). The final grading of the total cover system will result in a slope no less than 3.0%.

Summary of Estimated Remedy Costs

The cost for the selected alternative is reproduced below primarily from the Feasibility Study. The only changes from the original table is the amount of topsoil needed for cap construction.

Feasibility Study Cost Estimate

Alternative Number 4A

MIG/DeWane Landfill / Belvidere, Illinois

Remedial Task	Quantity	Unit	Unit Cost	Total Cost	Subtotal	Cost Basis
A. Leachate Piezometer and Gas Probe						
Installation						
Mobilization	1	lump sum	$1,500	$1,500		Two mobilizations required
Leachate Piezometer Installation	8	each	$5,000	$40,000		Approx. 50 ft in depth
Landfill Gas Monitoring Well Nests (two each)	6	each	$3,500	$21,000		Approx. 15 and 25 ft in depth
Decontamination Equipment	12	days	$300	$3,600		
Geologist Oversight	15	mandays	$1,500	$22,500		
Total Cost for Monitoring Systems					**$88,600**	
B. Cap Construction						
Surface Water Diversion Ditches	2,500	linear feet	$25	$62,500		Along RR track and borrow pit
Erosion Controls	1	lump sum	$15,000	$15,000		Primarily silt fencing required
Pipe Surface Water Runoff to Kishwaukee River	1,500	linear feet	$60	$90,000		Assumes direct routing to north
Discharge Structure	1	lump sum	$25,000	$25,000		
Side Slope Grading	40,000	cubic yards	$12	$480,000		Assumes uniform runoff
Geodrainage Net	2,041,000	square feet	$0.70	$1,428,700		Side slopes and crest
Geosynthetic Clay Liner	2,041,000	square feet	$0.90	$1,836,900		Covers delineated refuse
Geotextile Fabric	2,041,000	square feet	$0.45	$918,450		Side slopes and crest
Topsoil (2.5 feet)	166,067	cubic yards	$15	$2,491,000		Side slopes and crest
Seeding	52	acres	$2,200	$114,000		
Total Cost for Cap Construction					**$7,461,950**	
C. Leachate Bed Construction						
Leachate Drain Beds	50,000	square feet	$6	$300,000		Upper portions of major seeps
Leachate Drainage Piping	3,000	linear feet	$12	$36,000		Routed to sumps

Sump Stations	3	each	$11,000	$33,000		Located at toe of landfill
Force Main Piping to Belvidere POTW (Note 1)	5,000	linear feet	$17	$85,000		Tie-in along BR US20
Sewer Tie-In	1	lump sum	$10,000	$10,000		Includes sampling manhole
Leachate Storage Tanks (30,000 gals)	2	each	$78,000	$156,000		Includes automated monitoring
Leachate Disposal (Note 1)	1,200,000	gallons	$0.50	$600,000		120,000 gals/yr avg for 10 yrs
Total Cost for Leachate Beds					**$1,220,000**	
D. Gas Collection System						
Passive Vent Wells	17	each	$5,000	$85,000		Approx. 50 ft depth
Wellhead Completion	17	each	$2,000	$34,000		
Passive Trench	1,500	linear feet	$200	$300,000		Approx 25 ft depth
Total Cost for Gas Collection					**$419,000**	
E. Closure of Surface Impoundment						
Removal and Disposal of Liquids	300,00	gallons	$0.25	$75,000		
Excavation of Sediments/Consolidation	650	cubic yards	$25	$16,250		Approx. 1 to 2 ft depth
Backfill to Grade	6,000	cubic yards	$12	$72,000		Native soils backfilled to grade
Total Cost for Impoundment Closure					**$163,250**	
F. Engineering and Construction Costs						
Permitting and Legal Fees (1%) (Note 2)				$113,188		
Mobilization / Demobilization (2%)				$174,136		
Engineering Design (10%)				$957,748		
Health and Safety (3%)				$261,204		
Engineering Oversight (5%)				$348,272		
Bonding and Insurance (3%)				$261,204		
Construction Management (7%)				$609,476		
Cap Construction QA/QC (1.5%)				$130,602		
Construction Overhead and Profit (15%)				$1,306,020		
Contingency (10%) (Note 3)				$870,680		
Total Indirect Capital Costs					**$5,032,530**	
G. Annual Operation and Maintenance						

Groundwater, Leachate, Gas Monitoring (Note 4)	1	annual	$40,000	$40,000		Annual sampling of each well
Well Replacement, Repairs, Redevelopment	1	lump sum	$15,000	$15,000		10 yr life cycle for each well
General Facility Maintenance	4	quarters	$3,000	$12,000		Basic road, fencing repairs, etc
Cap Inspection and Maintenance	4	quarters	$6,000	$24,000		Major repairs will not be required
Passive Gas Vents Inspections/Repairs (Note 5)	1	lump sum	$20,000	$20,000		10 yr life cycle for each well
Passive Trench Inspections/Repairs	1	lump sum	$15,000	$15,000		10 yr life cycle for each trench
Landscaping	100	acres	$150	$15,000		Mowing, fertilizing, etc.
Reporting/Project Management	1	lump sum	$60,000	$60,000		
Total Annual O&M Cost					**$201,000**	
Net Present Value for Annual O&M					**$3,089,862**	5% discounted over 30 years
TOTAL NET PRESENT VALUE COST FOR ALTERNATIVE 4					$17,475,193	

NOTES:

(1) The leachate disposal cost estimates are based on continuing transportation to the Rockford POTW. Pretreatment costs are not included, since a permit is already in place to transport leachate to the Rockford POTW, and pretreatment has not historically been required (i.e., leachate constituents did not exceed applicable pretreatment criteria). The cost for a forcemain to the Belvidere POTW was also included in the event approval can be obtained to directly discharge leachate to that treatment plant for a comparable unit cost without pretreatment.

(2) The actual percentages used to determine the "Permitting and Legal Fees" and "Engineering Design" line items were adjusted slightly upward, and the actual percentage used for the "Engineering Oversight" line item adjusted slightly downward, from the indicated percentages to allow for proper comparison versus the other remedial alternatives.

(3) A contingency of only 10% has been used given the conservative unit costs used for each line item.

(4) For simplicity in determining net present value, the monitoring costs are based on the annual sampling of up to 20 groundwater monitoring wells and the existing leachate and gas monitoring wells. The FFS text describes quarterly monitoring for the first two years and annual sampling thereafter. The costs associated with the six extra sampling events over the first two years were distributed over the 30-year discounting period and then added to the annual cost. In actuality, the annual monitoring cost is comprised of $32,000 for the annual monitoring requirements, and an additional $8,000 distribution from the extra six monitoring events to be performed during the first two years. The annual monitoring costs include the following: a two-person sampling crew in the field for three days; an extra three field days throughout the year to take quarterly water level measurements; analysis of the 22 groundwater and leachate samples for VOCs, metals, and water quality parameters according to RI protocol; analysis of both gas samples for VOCs. Reporting costs are included in the "Reporting/Project Management" line item.

(5) Quarterly monitoring costs for the landfill gas collection system are included in this line item. Gas probes will be monitored using field instrumentation for % LEL, % methane, % oxygen, % carbon dioxide, and total VOCs using a PID or FID.

Expected Outcomes of the Selected Remedy

Land use for the site during the last thirty years has been for refuse disposal. Prior to the site becoming a landfill it was used to extract sand and gravel, and for agricultural purposes. The expected future land use will be restricted with no development because the site is a landfill, and because of the type of final cap to be installed. Land use for the soil borrow-pit to the west will continue to be restricted. Its present use is already restricted due to the fact that it is a soil borrow

area pit. Deed restrictions prohibit all residential development of the site and all uses of groundwater. The soil borrow pit area also presently contains the landfill gas interceptor trench, gas extraction wells, gas probes and groundwater monitoring wells. The agriculture field to the north is part of a planned GMZ for contaminated groundwater. Boone County Department of Health ordinances prohibit installation of groundwater drinking wells in the flood plain. The agricultural field presently has use restrictions because it is within the flood plain of the Kishwaukee River and Boone County zoning ordinances restricts development. City water is provided to the residential development downgradient and west of the landfill.

Groundwater use offsite is restricted as is mentioned above. If further restrictions are needed they will be required as part of the final remedy. The time frame to achieve cleanup for offsite groundwater to Class I groundwater quality criteria ARARs is expected to range from 13 to 26 years for West Glacial Pathway for both the planned and contingent leachate removal scenarios, and using natural attenuation. For the North Interface Pathway the time for cleanup ranges from 54 to 108 years, depending on the leachate removal scenarios. For the planned leachate removal scenario, it is estimated that groundwater remediation will occur in a range from 81 to 108 years. However, under the contingent leachate removal scenario groundwater remediation is estimated to range from 54 to 81 years. Upon achieving cleanup levels to Class I criteria, groundwater use may continue to be restricted to agricultural and industrial use, depending on local ordinances. The use of onsite groundwater, and as necessary, offsite groundwater will be prohibited by deed restrictions. The time frame to remove and reduce methane gas to safe and ARAR (35 IAC 811) compliant levels from the area of the subdivision was estimated to be less than one year during the 1999 emergency response action. The time frame estimated for reducing landfill gas migrating from the landfill down to acceptable ARAR levels is not certain, but landfill gas generation rates have been declining since 1988.

The final cleanup level for each identified medium of concern that are expected to occur based on the chosen remedial alternative and its various components is described below. Although groundwater had not been identified in either the RI or baseline risk assessment as a media of concern, low levels of various constitutents and some VOCs were detected in down gradient groundwater. The final clean up levels for each contaminant in offsite groundwater will be the appropriate MCLs, ARAR, or similar mandated or recommended level for each COC. The offsite migration of landfill gas has been undergoing emergency response remediation since early May 1999. Since that time, the offsite migration of landfill gas to the west towards the subdivision has been significantly reduced. Gas remediation will continue until as long as necessary to be protective of human health, and the environment. In general, compliance with the groundwater and solid waste ARARs that relate to landfill gas will meet this requirement.

The anticipated socio-economic and community revitalization impacts of the selected remedy is unknown at this time. The anticipated environmental and ecological benefits are the cleaning up of groundwater to Class I criteria and the protection of surface waters such as the Kishwaukee River, as well as the adjacent wetlands.

XIII. Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, attain Federal and State requirements that are applicable or relevant and appropriate for this remedial action (or invoke an appropriate waiver), are cost-effective, and utilize permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes.

Protection of Human Health and the Environment

Alternative 4A will be protective of human health and the environment. The reduction of precipitation into the landfill would be expected to be between 97% and 99%. The cap will be protective of human health and the environment and play a major role in cleaning the groundwater ultimately to Class I groundwater criteria levels, by effectively reducing leachate generation and contaminant migration. This cap option provides an adequate protective soil layer depth for the GCL component of the cap against the effects of freeze-thaw cycles, thus maintaining cap integrity.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy is comprised of a variety of ongoing actions including leachate collection and treatment, landfill gas collection, residential gas collection, installation of a permanent protective landfill cap, and treatment of groundwater through monitored natural attenuation. These actions will comply with all ARARs. The ARARs identified in the Feasibility Study are reproduced below.

TABLE 4-1

Initial Screening of Potential ARARs & TBCs

State and Federal Requirements and Prerequisites for Applicability

MIG/DeWane Landfill / Belvidere, Illinois

DESCRIPTION	REQUIREMENTS AND PREREQUISITES FOR APPLICABILITY	CITATION
	LOCATION-SPECIFIC ARARs & TBCs	
Within Floodplain	Actions to avoid adverse effects, minimize potential harm, or restore and preserve natural and beneficial values in the event remedial construction activities impact and identified floodplain area. The actions will occur	Protection of floodplains (40 CFR 6, Appendix A); Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40

	in a floodplain including lowlands, relatively flat areas adjoining inland and coastal waters, and other flood prone areas. The landfill construction shall not restrict the flow of a 100-year flood, result in washout of solid waste from a 100-year flood, or reduce the temporary water storage capacity of the 100-year floodplain.	CFR 6.302; Exec. Order No. 11988; 93 IAC 708, IL Rev. Stat., CH 19; 35 IAC 811; Boone Co. Ordinance No. 88-02
General Use Water Quality Standards	General use standards protect the waters of the State for aquatic life, agricultural use, primary and secondary contact use, most industrial use, as well as ensure the aesthetic quality of the State's aquatic environment.	35 IAC 302.208
Air Quality Standards	Ambient air quality standards to be maintained at all times.	35 IAC 243
Air Emissions from Landfill Gas Collection Operations	National primary and secondary ambient air quality standards (NAAQS) for sulfur dioxide, particulate matter, carbon monoxide, volatile organic compounds (ozone), and nitrogen dioxide. Air emissions of these Parameters shall not cause an exceedance of these standards.	40 CFR 50, 60; 35 IAC 214, 215, 216, 217
Area Affecting Stream or River	Actions to protect fish or wildlife. Applies when diversion, channeling, or other activity that modifies a stream or river affects fish or wildlife.	Fish and Wildlife Coordination Act; 40 CFR 6.302
Wetlands	Site-specific operating permit requirements for activities which impact wetlands.	U.S. Army Corps of Engineers permit
Endangered Species	Requires actions to conserve endangered species within critical habitats upon which endangered species depend. Includes consultation with the Department of the Interior.	16 USC 1531; 50 CFR 200
	ACTION-SPECIFIC ARARs & TBCs	
A. REMEDIAL CONSTRUCTION RELATED	**The following are requirements related to remedial action construction activities.**	
Occupational Safety and Health Act	Regulates worker health and safety during remedial construction activities.	29 U.S.C. 651-678; 29 CFR 1910, 1926
American Council of Governmental Industrial Hygienists (ACGIH)	Establishes safety and allowable worker exposure standards for use in remedial construction activities.	Threshold Limit Values
Visual Emission Standards and Limitations	Emission standards for stationary sources and fuel combustion emission systems.	35 IAC 212

Mobile Air Pollution Standards	Motor vehicle air emission standards.	35 IAC 240
Particulate Criteria for Stationary Sources	Particulate matter is not to be emitted into the atmosphere which exceeds allowable emission levels. Fugitive particulate matter from any storage or material handling process including truck loading, conveyors, Stockpiles, etc. during construction must be controlled.	35 IAC 212
Noise Limitations for Motor Vehicles	Regulation applicable to all motor vehicles in Illinois.	35 IAC 902
Stormwater Management	Stormwater management during construction activities.	40 CFR 122.44; 35 IAC 811
Monitoring Well Construction	Establishes the minimum requirements for the construction of monitoring wells.	77 IAC 920
Sealing of Drilling Boreholes	Establishes minimum requirements for plugging and sealing of boreholes.	35 IAC 811
B. AIR MISSIONS RELATED	**The following are requirements related to air emissions during long-term operation of the landfill gas collection system.**	
National Emission Standards for Hazardous Air Pollutants (NESHAPs) and (HAPs)	Identifies HAPs and sets NESHAPs on an industry, process, or chemical-specific basis. Includes monitoring, testing, reporting, and recordkeeping requirements for each.	40 CFR 61, 63, 70; 35 IAC 243
Landfill Gas Management	Design gas collection system for odor free operation. Control of emissions from equipment, including particulate matter, sulfur, organic material, carbon monoxide, and nitrogen oxides. File an Air Pollution Emission Notice (APEN) with State to include estimation of emission rates for each pollutant expected. Establishes odor criteria to identify odorous offsite emissions which must be controlled.	40 CFR 52 35 IAC 211, 212, 214, 215, 216, 217 40 CFR 52 35 IAC 245
Construction and Operating Permit Requirements for Emission Sources	Persons shall not discharge any contaminant into the environment causing air pollution in Illinois. A construction and operations permit is required for construction or modification of any emission source.	35 IAC 201
C. RESIDUALS DISPOSAL RELATED	**The following are requirements related to the disposal of residual material from soil and sediment excavation, or sludges or other residuals generated from leachate pretreatment system operations.**	

Identification and Listing of Hazardous Waste	Defines those solid wastes which are subject to regulation as hazardous wastes.	40 CFR 261; 35 IAC 721
Hazardous Waste Generation, Storage and Disposal	Site must obtain a USEPA identification number. Generator use and management of hazardous waste containers must meet treatment facility requirements. Generator tank storage of hazardous waste must meet design and storage requirements for treatment facilities, excluding closure requirements. Temporary onsite storage of hazardous waste for offsite disposal. Temporary storage of excavated soils and sediments in surface waste piles must meet requirements for treatment facilities. Ensure that hazardous constituents are contained or immobilized within the waste pile.	40 CFR 262; 35 IAC 722 40 CFR 264 Subpart I; 35 IAC 724 40 CFR 264 Subpart J: 35 IAC 724 35 IAC 722 40 CFR 264 Subpart L; 35 IAC 724
Hazardous Materials Transportation Regulations	Regulates transportation of hazardous materials under DOT regulations, hazardous wastes under EPA regulations, and special wastes under Illinois EPA regulations.	49 CFR 107, 171-177 and 40 CFR 263; 35 IAC 722, 723, 724
Transportation of Hazardous Substances	IDOT requirements for transportation over Illinois highways.	92 IAC 171, 172, 173
Special Waste Hauling	Applies to all hauling of special wastes under Illinois EPA regulations.	35 IAC 808, 809
Haulage Limitations on Roadways	Oversized vehicles need a permit to travel on roadways.	IDOT Dir. of Highways Sec. 15 Ill. Vehicle Code based on Federal Bridge Formulas
Placement of Hazardous Waste in Land Disposal Unit	Specific land disposal restrictions associated with the placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, or underground mine or cave.	40 CFR 268 (Subpart D)
D. SOLID WASTE/ LANDFILL DISPOSAL	**The following requirements apply to the implementation of a final remedy, as well as the individual components of the remedial action. Potentially applicable Illinois solid waste/landfill regulations are noted.**	
Previously Closed Landfills	Provides requirements for solid waste permits, sanitary landfill requirements, closure and post closure care, and financial assurance for Municipal Solid Waste Landfills (MSWLFs) closed prior to 1990.	35 IAC 807
Existing Landfills Still Operating	Provides requirements for solid waste permits, sanitary landfill requirements, closure and post closure care, and financial assurance for existing MSWLFs prior to 1990 which are still operating.	35 IAC 814

New Landfills	Provides requirements for solid waste permits, sanitary landfill requirements, closure and post closure care, and financial assurance for new MSWLFs after 1990.	40 CFR 258; 35 IAC 811
E. LEACHATE DISCHARGE RELATED	**The following are requirements related to the treatment and discharge of leachate.**	
Permit for the Construction and Operation of Treatment Works	Illinois EPA permit requirements for construction and operation of treatment and pretreatment systems and the corresponding discharge authorization.	35 IAC 309
Discharge to Publicly Owned Treatment Works (POTW)	Pretreatment standards for discharge; includes prohibitions on the discharge of pollutants that pass through the POTW without treatment, interfere with POTW operation, contaminate POTW sludge, or Endanger health/safety of POTW workers. Criteria for monitoring of treated water at a POTW. City of Belvidere and Rockford POTW pretreatment requirements.	40 CFR 403; 35 IAC 307, 310 35 IAC 304 Local POTW regulations
Leachate Storage	Underground storage tank design, construction, installation, and operational requirements.	40 CFR 280; 35 IAC 170
	CHEMICAL-SPECIFIC ARARs & TBCs	
Safe Drinking Water Act	Establishes primary and secondary maximum contaminant levels (MCLs), which are enforceable standards of maximum permissible levels of contaminants in drinking water from a public water source.	40 U.S.C. 300; 40 CFR 141, 143
Maximum Contaminant Level Goals	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety.	Pul. L. No. 99-339, 100 Stat. 642 (1986); 40 CFR 141
Illinois Groundwater Quality Standards	Establishes groundwater classes and chemical-specific water quality standards for the State of Illinois. Also provides for determination of a health advisory for other chemicals and mixtures.	35 IAC 620
General Use Water Quality Standards	General use standards protect the waters of the State for aquatic life, agricultural use, primary and secondary contact use, most industrial use, as well as ensure the aesthetic quality of the State's aquatic environment.	35 IAC 302
Ambient Water Quality Criteria	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	40 CFR 131; Quality Criteria for Water, 1976, 1980, 1986

Cost-Effectiveness

In the judgement of Illinois EPA, the selected remedy is the most cost-effective. In making this determination, the following definition was used: "A remedy shall be cost effective if its costs are proportional to its overall effectiveness." (NCP Section 300.430(f)(l)(ii)(D)). This was accomplished by evaluation the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent. Alternative 4A meets the nine criteria, complies with ARARs, and with a cost that is in the mid-range of the various remedial options.

The total estimated cost for the project is approximatley $17,475,193.00.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

Illinois EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, Illinois EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, bias against off-site treatment and disposal, and considering community acceptance.

The Selected Remedy effectively meets landfill containment requirements by limiting infiltration of surface water into the landfill and thus achieving significant reductions in COC volumes leaving the landfill, and the COC concentrations in the groundwater. The selected remedy does not present short-term risks different from the other treatment alternatives. There are no special implementability issues that set the selected remedy apart from any of the other alternatives evaluated.

Preference for Treatment as a Principal Element

Part of the selected remedy involves collecting the leachate and treating it offsite. By utilizing treatment as part of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy

continues to be protective of human health and the environment.

XIV. Documentation of Significant Changes

The Proposed Plan was released for public comment in July, 1999. It identified Alternative 4A as the preferred alternative. The Alternative 4A landfill cover alternative, with its soil depth modifications, was chosen, in part, to ensure an adequate reduction of groundwater infiltration into the landfill, thus reducing leachate and landfill gas generation, and reducing the contamination of groundwater by leachate.

The original Alternative 4A provided for thirty inches of protective soil cover over the GCL layer on the landfill crest and tapering to twenty-four inches at the toe of the landfill slope. Presently on the landfill the interim cap is twenty-four inches of compacted soil cover on the crest and approximately six inches of noncompacted soil on the slopes. The Illinois EPA originally was requiring a grading/foundation layer of eighteen inches of compacted soil on the side slopes. After additional Illinois EPA evaluation, it was determined that a minor modification to the technical aspects of the remedy could be effected without sacrificing overall protection of human health and the environment, or ARAR compliance. The twenty-four inch interim cap on the landfill crest will be used as the foundation layer. A maximum of six inches of soil from the existing cap will be removed from the crest to add to the side slopes to bring the side slope foundation layer depth up to a minimum total of twelve inches compacted soil prior to the placement of the remaining components of the cap (i.e., geosynthetics and soil).

The contingent remedies for groundwater, depending on the baseline risk assessment addendum, may result in a significant change. The addendum's impact on the potential risks's associated with the COCs concentrations in groundwater west of the landfill will not be more fully known (and thus its significance) until after the document is completed later in 2000.

MIG/DeWane Landfill Superfund Site Belvidere, Illinois

Responsiveness Summary
for the
Proposed Remedial Alternative

Illinois Environmental Protection Agency

March 2000

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AGENCY DECISION

The Illinois Environmental Protection Agency (Illinois EPA) prefers remedial alternative 4A which is detailed on page 9.

HISTORY BACKGROUND

The MIG/DeWane Superfund site (also known as Boone County landfill, Bonus landfill, or Kennedy landfill) is located in Boone County approximately 0.25 miles east of the city of Belvidere, Illinois and 0.5 miles north of Business U.S. Route 20. Primarily located in the south half of the southeastern quarter of Section 30, Township 44 North, Range 4 East of the Third Principal Meridian. The landfill covers an area of approximately 47 acres.

From 1969 through 1988, the landfill accepted approximately 3.7 million cubic yards of household or residential, municipal, commercial, and industrial waste. In 1984, the United States Environmental Protection Agency (U.S.EPA) conducted a sampling inspection of the landfill to evaluate it for Superfund consideration. In 1985, the State of Illinois filed a complaint against the landfill for violating their landfill operating permit by exceeding the maximum height restriction by 20 feet or more. A court injunction ordered the landfill to cease operations and it closed in June 1988. Instead of properly covering the waste and closing the site, the owners abandoned it in July 1988. The landfill was placed on the National Priorities List (NPL) on August 30, 1990.

There was a problem at the landfill associated with inadequate soil cover, exposed refuse, and multiple leachate flows in the early 1990's that was addressed by the interim response actions in late 1991 through early 1993. Groundwater contamination has also been detected and investigated to determine the extent and remedy necessary to manage any identified risks associated with the groundwater conditions. In early 1999, a landfill gas migration problem was identified. A gas extraction system was installed within a month and the gas levels decreased when the system was activated.

PUBLIC NOTICE AND PUBLIC HEARING

The public hearing notice was published thrice (June 10, 17 and 24) in the *Boone County Journal* newspaper. The public hearing notice was published thrice (June 11, 18 and 25) in the *Belvidere Daily Republican* and in the *Rockford Register Star* newspapers. The public hearing notice was posted on the Illinois EPA's web site home page (http://www.epa. state.i1.us) on June 18, 1999. Notice of the hearing was sent to legislators, local officials, neighbors and interested citizens on June 14, 1999.

In accordance with the Comprehensive Environmental Response, Compensation, and Liability

Act (CERCLA) of 1988 Section 117, 42 U.S.C. Section 9617 and pursuant to the Illinois EPA's *Procedures or Information and Quasi-Legislative Public Hearings* 35 Illinois Administrative Code (IAC) 164, the Illinois EPA held a public hearing on Tuesday, July 13, 1999. The public hearing began at 7 p.m. in the Boone County Community Building, 111 West 1st Street, Belvidere, Illinois. Twenty-eight persons attended the hearing with a court-reporter recording the proceedings. The Illinois EPA proposed placing a multi-component cap over the MIG/DeWane landfill according to the provisions of remedial alternative 4A. A transcript of the public hearing was prepared and is available for review at the public repository.

The Illinois EPA received written and oral public comments on the proposed landfill cap. The public comment period began on Friday, June 11, 1999 and ended on Friday, August 13, 1999. Several requests were received from individuals or groups for an extension. All requested extensions were granted and comments from those parties were due Friday, August 27, 1999.

Before determining which remedy would be most effective for the site, the Agency considered written and oral comments on any of the proposed alternatives. The final Agency decision includes this summary of questions and comments received along with Agency responses.

RESPONSIVENESS SUMMARY

The hearing record opened on Thursday, June 10, 1999, and closed on Friday, August 27, 1999. Comments postmarked by midnight August 27, 1999, were included in the hearing record. This responsiveness summary responds to questions and comments received from June 10, 1999, through August 27 (postmark), 1999, and comments from the public hearing.

Comments are a combination of direct quotes and summarized ideas (if several comments were similar) and they appear in regular type. **The Illinois EPA responses are in bold type.**

1. According to the Baseline Risk Assessment (March 1997) that evaluated the current and possible future risks associated with the site, a conclusion was made that there would be an unacceptable level of risk for "future residents" from the leachate, groundwater, and landfill gases that could flow off-site and/or under the subdivision. Since the "future residents" of 1997 are now the current residents of 1999, what actions are being taken to address and reduce the risk level to within acceptable boundaries which is necessary to protect the health of the residents?

   According to the risk assessment definitions, the future residents were occupants of homes built as close as 60-100 meters (200-300 feet) from the landfill. The risk assessment also assumed chronic long term exposure from a site with no remediation. The closest home is more than 700 feet away and the site has already had some remediation with more planned, so the risk would be lower than what the 1997 risk assessment showed but the Illinois EPA agrees with the spirit of this comment that

request them to be removed at no cost to the residents. This issue will be handled by representatives of the MLTF.

In addition, the Illinois EPA has initiated a contract with the same consultant that performed the 1997 baseline risk assessment to provide an current assessment using the most recent information and sampling results so that an updated account can be made about potential health risks that may affect the residents. U.S.EPA has also provided updated comments and a re-review of the 1997 baseline risk assessment regarding whether the current conditions have significantly altered the "future residents" findings of the 1997 risk assessment. USEPA and Illinois EPA have both concluded that new sample data is needed to calculate an updated risk assessment characterizing the current conditions at the site and within the Wycliffe Estates Subdivision. Samples for this purpose were taken in February and March with results expected back within one month.

2. The area around the landfill needs to be fully and completely surveyed to determine exactly where the sand/gravel seam is present so that it can be determined which homes could be affected by the methane or any other contaminants (including chlorinated solvents)that may migrate. (This would also provide some assurance for homes that could not be affected due to an identified barrier.)

The Illinois EPA believes that the proposed remedy's provision of both an intercept trench and regular monitoring of the various gas probes and wells provides a protective barrier to gases or other contaminants (including chlorinated solvents) that could attempt to migrate into the subdivision undetected. Although a geologic survey would provide some comfort to residents, it is very costly, the drill rig itself could have trouble accessing some areas with all the homes that are now present, possibly damaging yards or structures. Operating the rig so close to homes and people presents safety concerns, and the findings may still not offer the assurance which the residents desire. We believe it is better to address any problems at the landfill source and prevent them from migrating rather than speculating where a problem would or would not occur if the contaminants were allowed to migrate.

3. There should be more monitoring wells installed, along with a 30 to 50 year monitoring plan that has frequent monitoring of all contaminants, not just methane.

The proposed remedy provides for groundwater and soil-gas samples to be taken on a long-term basis. The analysis performed on the samples would detect methane and other contaminants associated with a landfill if present. Those sample results will be available to the public for examination. If contaminant levels exceeded the regulatory standards, actions could be taken to address a problem until the levels were once again protective of human health and the environment. After an initial period of

any risk above acceptable levels must be fully addressed by the proposed plan to provide a level of protection that is both acceptable by design and by actual performance. Simply stated, the current residents of Wycliffe Estates and the surrounding area need to be protected from any adverse effect the landfill wastes may present that violates acceptable standards. The proposed remedy will provide the following actions specifically tailored to the protection of Wycliffe Estates and other area residents:

- The landfill gas interceptor trench that extends along the West side of the landfill will continue to operate as a barrier to any landfill gases trying to migrate West into the borrow pit area. The gas extraction wells behind the Bethany Drive homes will also continue to operate until the presence of landfill gas has been reduced to levels that do not pose health or flammability threats to the residents. (Note: Although the methane levels may be reduced to 0 while the extraction wells are operating, since methane is a naturally occurring gas in the ground it is expected return to very low levels. Regulatory standards protect residents from the higher unacceptable levels.) Even when the extraction wells behind the homes have completed the removal of the gases, the interceptor trench over at the landfill will continue to operate as a barrier designed to prevent any recharge from the landfill. Monitoring of the systems will be required to demonstrate their initial and continued success.

- The extraction wells have performed better than anticipated for removing the methane gas from the ground but it will require some time to remove the very last bit that is held within some of the more tightly packed clay soils. It will also take time once the system is shut off to demonstrate that even without the system running, homes remain protected. As of March 2000, six weeks worth of monitoring data had been collected and it indicates that the methane levels in both the borrow pit and the Wycliffe Estates area have been reduced below levels of concern. The monitoring data will continue to be collected into mid-April before a determination is made of whether the gas migration problem has been adequately addressed. Additional monitoring will also continue to demonstrate continued compliance and protection.

- The homes that had a venting system installed on their sump pumps have been advised to contact the MIG/DeWane landfill task force (MLTF) to settle any issues related to costs or maintenance matters. Any issues outside the regulatory jurisdiction of the Agency's at this site should contact the MLTF or consult with counsel about how to best resolve the issue.

- All the homes with the methane monitors/alarms will either be provided with the necessary maintenance and calibration service to maintain those units or will be provided with an "all clear" statement when it is issued for the area. It is our understanding that the Wycliffe home owners may either keep the detectors or

between two and five years, monitoring data is formally evaluated to determine if changes need to be made to ensure the site is in compliance. The proposed remedy also calls for site monitoring activities over a minimum of 30 years with a formal regulatory review at least every five years throughout that period. During the review process the frequency of sampling could be reduced but only if the review showed no need to continue the more frequent monitoring schedule.

4. There should be an active gas collection system and/or numerous more passive vents installed at the landfill to reduce any gas that could accumulate under the proposed full cap.

The proposed remedy mandates a system of passive vents throughout the surface of the landfill. The actual number of vents installed will need to satisfy an engineering design that shows the capability of properly venting the landfill so as to eliminate any gases from building up under the cap. If the passive vents do not relieve the gases as designed, they can be upgraded to active vents to provide the proper collection of gases. The interceptor trench and six gas extraction wells behind the Bethany Drive homes are already an active collection system and will be operated for as long as is necessary.

5. Gas probes should be installed throughout the entire subdivision.

There are currently 6 gas probes directly behind the homes along Bethany Drive and 6 additional gas probes located in the subdivision between Bethany and Jamestown Avenue. The current results indicate that additional gas probes are not necessary.

6. How do the residents know that there will not be another more serious incident?

The mandated provisions of the proposed remedy are environmentally sound enough to detect an approaching problem and binding enough to provide action to be taken in a timely manner to maintain the continual protection of the residents. The final remedy, especially for a site like MIG/DeWane landfill that has experienced a documented methane migration in the past, will be subject to even closer scrutiny than a landfill that has not revealed such a potential to influence off-site property.

7. Since the PRP's did not implement the gas removal system as proposed, but implemented a cheaper, more obtrusive system, how do we know they will implement the recommendations in the proposed plan?

During the April emergency response, the goal was to get the protective systems

operating as soon as possible. The final remedy will be outlined in a legally binding document that the PRP's sign called an Administrative Order by Consent (AOC). The PRP's must strictly adhere to the provisions of the Record of Decision (ROD) and the AOC or they could be subject to enforcement actions by the Illinois EPA and/or the U.S.EPA. During the April emergency the PRP's cooperated on a voluntarily basis and much of the strict authority available to the Agencies was not used.

8. What will the Illinois EPA and U.S.EPA do to ensure that the collection system will be maintained until it is absolutely 100% certain that there will not be another methane or toxic gas exposure to the residents?

It is not possible to provide a 100% assurance even with the system operating, but the highest level of certainty, safety, and precaution will be maintained on the citizens behalf by this Agency. We will use any provision available to us by the law to ensure complete and full compliance by the PRP's to maintain a system that is protective of human health and the environment. If for some reason the PRP's were not providing the necessary actions to ensure public safety according to the provisions of the proposed remedy and the subsequent legal documents, both the U.S.EPA and the Illinois EPA could act to maintain the protectiveness necessary.

9. Can't the blower and flare that are venting the landfill gases be relocated to somewhere that the residents won't see, hear, or smell any affects of it?

The blower and flare are currently located on the Northwest corner of the landfill, approximately 800 feet away from the closest residence. The flare is partially obstructed from view by a stand of trees and since prevailing winds are to the East, it does not pose an odor nuisance except for a very few times each year, and those few days would not pose a health exposure problem. The flare is at the location that best suits the operation of the interceptor trench system. The noise factor will be looked into to see if the flare could be maintained at its current location without causing a nuisance noise problem.

10. Given the past events where data showed a potential problem years before the emergency occurred, please report the status of the site's soil, gas, or water issues and all monitoring data to the citizens in the area on a regular basis, including any increases, decreases, spikes or trends that may or may not affect the residents of Wycliffe Estates.

The Illinois EPA will commit to providing updates of the site through the use of fact sheets and if requested, we can hold public information sessions to explain and answer questions about the data. These could be scheduled on a regular basis as the citizens desire (quarterly, bi-annually, annually, etc). If the status of something changed

quickly, an urgent message about a spike or condition could be relayed through these same channels on an even more immediate basis.

11. Can the final remedy be implemented on an expedited basis to provide for the immediate protection of the residents?

The Illinois EPA plans to sign the Record of Decision for this site in Spring 2000. Following that, an Administrative Order by Consent (AOC) will be issued to ensure the PRP's comply by developing construction plans in 2000 with actual construction of the cap and remediation systems starting in 2001. The gas emergency systems that have been operating since April 1999 are adequately reducing the identified risks and providing for the protection of the residents. Those systems will continue to operate until the additional permanent solutions are in place or until the need for the system has been demonstrated not to be necessary.

12. Since the preferred alternative is a combination of Alternatives 4 and 5 from the FFS document and it was not actually evaluated in the FFS document as the other alternatives were, it has been proposed that the preferred alternative 4A of the proposed plan be modified in the following manner:

i) There should be a performance basis established for each design component of Alternative 4A.
ii) Alternative 4A should exclude any new detailed design specifications not included in Alternative 4 of the FFS.
iii) Alternative 4A should require pre-design investigations and remedial design analysis that will produce detailed design specifications that fully satisfy the performance basis concerns.
iv) Alternative 4A should provide flexibility with respect to the development of the detailed design specifications so that the pre-design/design process can be used to optimize the performance, implementability, and cost effectiveness of the project.

As an overall response to the entire comment, the Illinois EPA and the U.S.EPA agree that any criteria followed in the FFS to provide proper design and remedy implementation should also be performed on Alternative 4A. The proper steps will be taken to ensure that Alternative 4A is the most adequate and efficient final remedy and that will be documented in the same way as any of the selected remedies.

Now, specifically responding to the individual comments.

The Agencies agree with comment (i) and a performance based criteria may be incorporated were applicable in the design component of Alternative 4A. However, specific minimum design criteria and specifications must also be incorporated into each component.

Comment (ii) will be considered but the request to exclude any new detailed design specifications not in Alternative 4 is denied. There may be the need to include these specifications due to performance based design parameters but they will need to meet the FFS criteria for evaluation if they are to be included.

Comment (iii) will be considered but it should be noted that all aspects of this final remedial action will be considered time sensitive and although a proper evaluation of the intended remedy is necessary, the pre-design investigations and design analyses will have very appropriate expectations for expeditious progress.

The goal of the Agencies is also to optimize the performance, implementability, and cost effectiveness of the project as mentioned in comment (iv). In that spirit, the flexibility realized toward that goal will be the greatest available under the law and our ability as Agency's to work cooperatively with the PRP's.

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FUTURE ACTIVITIES

After the close of the hearing record, the Illinois EPA evaluated all comments received before considering revisions to the proposed remedy. The remedy chosen by the Agency will be described in a document called the Record of Decision (ROD). The ROD is signed by both the Illinois EPA and the U.S. EPA. It is anticipated that the office of the Illinois Attorney General will negotiate a written legal agreement called an Administrative Order by Consent (AOC) with the owners and potentially responsible parties (PRP's) of the MIG/DeWane landfill. Besides requiring the PRP's to implement the remedy as chosen in the ROD, the AOC will address many of the legal issues specifying the applicable state and federal regulations the PRP's will follow when capping the landfill.

ILLINOIS EPA PREFERRED ALTERNATIVE

Based on the evaluation of available information, **the Illinois EPA recommends Alternative 4A.**

Alternative 4A: **Estimated Cost: $17.5 million.**

Alternative 4A was not proposed directly in the FFS. It is a modification and refinement of alternative 4. Alternative 4A involves the installation of a grading layer over the landfill side slopes, a Geosynthetic Clay Layer (GCL) cap over the entire landfill, a drainage layer over the entire landfill, and a 1½-foot protective soil layer over the GCL and drainage layer. This alternative requires the grading layer to be a minimum of 1½-feet in depth, with a final protective soil layer to be 2½-feet in depth on the crest and top of the landfill, with a minimum layer of 2-feet of protective soil at the bottom of the side slopes.

The landfill cap will conform to the Resource Conservation and Recovery Act (RCRA) requirements which include a double barrier designed to prevent infiltration of precipitation into the waste. The major differences between the use of clay or synthetic materials are availability, installation and cost. Material above the double barrier (topsoil, vegetation/rooting layer, drainage layer) and below (foundation layer) are common to all capping alternatives.

The components of storm water management, operations and maintenance, monitoring and passive gas venting are also included in the preferred alternative. The cap design would include surface water management features (e.g. berms, ditches, etc.) to direct runoff away from the landfill while minimizing erosion. The loss of soil overlying the barrier via erosion would potentially result in increased infiltration over time. Maintenance of the cap primarily focuses on repairing damage from erosion and cap settlement, and promoting an even growth of vegetation to stabilize the soil layers and prevent soil erosion. A program for long-term maintenance and monitoring would be implemented as part of this alternative. Maintenance would include regular inspections of the landfill area, repair of any damage to structures or the soil vegetation cover, and removal of sediment from ditches and other areas.

A system of passive vents to allow the release of gas vapors from the landfill waste would be constructed as a part of the landfill cap and would complement the existing active ventilation systems operating at the site.

The effectiveness of the current leachate system on the Northeastern third of the landfill has been successful and a leachate collection system for the other two thirds of the landfill will be installed. Monitor wells will be placed down-gradient of the landfill to monitor any leachate that is not being captured as well as groundwater conditions.

The FFS document includes a detailed analysis of all the remedial alternatives. The evaluation process was developed on the basis of the U.S.EPA Interim Final document "Guidance for Conducting Remedial Investigations and Feasibility Studies" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1988. That guidance document was developed based on the statutory requirements of CERCLA, program initiatives promulgated under the National Contingency Plan (NCP), and experience gained in the Superfund program. This proposed remedial alternative is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan and the Comprehensive Environmental Response, Compensation, and Liability Act.

PUBLIC REPOSITORY

All documents are currently available for viewing at:

Ida Public Library
320 North State Street
Belvidere, IL 61008

Please ask for the "MIG/DeWane" repository. The library is handicap accessible and has photo copiers available for cost.

DISTRIBUTION OF RESPONSIVENESS SUMMARY

Copies of this responsiveness summary will be mailed to all who registered at the July 13, 1999 hearing and to all who submitted written comments. Additional copies of this responsiveness summary are available from Mark Britton of the Illinois EPA-Office of Community Relations. (See below for address)

ILLINOIS EPA STAFF WHO CAN ANSWER YOUR QUESTIONS

Please contact the following individuals if you have any questions or concerns about this site.

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Illinois EPA - Bureau of Land	Illinois EPA - Director's Office
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HEARING RECORD AVAILABILITY

The following items are available from the Illinois EPA hearing officer for examination and review:

1. Public hearing notice.
2. Transcript of the July 13, 1999, public hearing.
3. Public hearing attendance record and authors of exhibits.
4. Hearing record exhibit list of letters, documents and notices.
5. Letters, documents and notices contained in the hearing record.

Illinois Environmental Protection Agency - Hearing officer
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